900 GENERAL POLICIES

Chapter 9 sets forth the DEB design, operation, maintenance and procurement guidelines for use in developing plans and specifications for construction and renovation of state facilities and which must be followed unless a waiver in writing is granted by the Director of the Division of Engineering and Buildings.

900.1 Design Criteria and Guides

This chapter contains DEB design criteria, operation and specification guides for the design of buildings constructed on state owned property which are to be used and maintained by state agencies. Agencies and their A/E must address the criteria and guides for their applicability to the particular project. Where the A/E determines that there is a valid reason for not meeting or using the criteria or guides, the A/E must present their findings and justification to use differing criteria to the Agency for their concurrence. The Agency may then forward the request in writing to DEB for approval to use the different criteria.

Design criteria for a particular campus may be stipulated by the Agency as a supplement to this Chapter under the authority of Section 917.1. Standard criteria, procedures and restrictions for construction at a particular campus may be stipulated by the Agency as a supplement to this Chapter under the authority of Section 917.2. Should a conflict arise between the standards and criteria in the Manual and the criteria stipulated by the Agency, those shown in the Manual shall govern.

900.2 Procurement Criteria and Guides

This chapter contains criteria, sample wording, procedures and guides for procurement of construction on state projects. As stated elsewhere in the **Manual**, certain items such as the General Conditions of the Construction Contract (CO-7), the Instructions to Bidders (CO-7a), the Contract (CO-9), the Notice of Invitation to Bid, the Standard Bid Form format and wording, and other similar forms have been reviewed and approved by the Office of the Attorney General and must be used in the procurement process. The Agency is responsible for assuring that the A/E follows the proper procurement forms, formats and procedures since the Agency is responsible for the procurement and responds to protests, etc. If BCOM should note discrepancies in the procurements documents or procedures during its reviews, the reviewers will certainly bring these items to the attention of the agency but addressing (or correcting) these issues will, in general, be left to the agency. Approval to use Proprietary Specifications or Sole Source Procurements still must be approved by the Director, DEB except where that approval authority has been specifically delegated to an Agency Representative. . Should a conflict arise between the standards and criteria in the Manual and the criteria stipulated by the Agency, those shown in the Manual shall govern.

900.3 Proprietary and Restrictive Procurement Procedures

900.3.1 Proprietary Specifications: In general, the Commonwealth's policy is to allow competitive bidding to the greatest extent practicable and to limit the proprietary procurement to only that material and/or work which has been justified and approved. From time to time, a situation arises in which only a single product will perform the required function. In such cases, the A/E should forward a request through the Agency to the Director of the Division of Engineering and Buildings fully justifying the use of the proprietary product. Proprietary or restrictive requirements shall not be used unless it is conclusively established that no substitute will serve the purpose. Timely submittal of the request is required to avoid delays in the work. Use of proprietary items/specifications is prohibited unless formal written approval is obtained.

900.3.2 Proprietary Specification Language: If proprietary space specification authorization is granted, the item should be specified by manufacturer's name and catalog number, followed by not withstanding any other provision of this contract, no other product will be acceptable or language of similar import. When the approved proprietary product is available from the manufacturer to two or more vendors or approved installers who regularly work in the area of the project, the product may be included in the project specifications for competitive bidding.

900.3.3 Sole Source or Franchised Vendors: When the approved proprietary product is available only through a sole source provider or installer, or when the Agency, or the BCOM determine that it is in the best interests of the Commonwealth, the Agency shall procure the proprietary product (including installation where applicable) in accordance with the provisions of Chapter 43, § 2.2-4303.E., Code of Virginia. The price for such proprietary procurement shall be placed on the bid form for use by all applicable bidders.

900.4 Separate Contracts for Material and Equipment

As an alternative to Proprietary and Restrictive Procurement Procedures, the proprietary procurement shall be deleted from the scope of the Work being bid (the project plans and specifications) and a separate contract procured by the Agency for such work.

900.4.1 General: All procurement must be made in accord with the Virginia Public Procurement Act. All assignment of contracts or materials must be done with the full prior knowledge of all parties to the contract. The use of 'allowances' is not competitive and has been deemed not to conform to the VPPA. Work outside of the general contract, that is Not In Contract (NIC) for bidding but is to be included in the construction, must be coordinated with the contract documents in one of the following ways.

900.4.2 Contractor purchased/Contractor Installed (subcontractor designated/price set by Owner): Drawings and specifications must be included that describe the work including: scope of work, materials, installation, testing, and quality control. The Bid Form must include a statement that informs the General Contractor to accept the subcontract and coordinate the work as if the General Contractor had selected the subcontractor. The Bid Form shall also include the

value/quote/negotiated price of the subcontract to be included in the Bid. An example of this is a pre-selected Building Automation Systems subcontractor.

900.4.3 Contractor purchased /Contractor Installed (materials contract assigned by the Owner): Drawings and specifications must be included that describe the work including: scope of work, materials, installation, testing and quality control. The Bid Form must include the value/quote/price of the materials contract and a statement that informs the General Contractor of the intent to assign a specific materials contract, and directs the General Contractor to accept and install the materials and coordinate the work as if the General Contractor had purchased the materials. An example of this is laboratory or kitchen equipment.

900.4.4 Owner purchased/Contractor Installed: Drawings and specifications must be included that describe the work including: scope of work, materials, installation, testing, and quality control. The Bid Form must include a statement that informs the General Contractor of the intent to provide specific materials in a specific location, and directs the General Contractor to accept and install the materials and coordinate the work as if the General Contractor had purchased the materials. An example of this is existing or pre-purchased laboratory or kitchen equipment. The Owner pays the supplier directly for the materials.

900.4.5 Owner purchased/Owner installed (or installed by Owner's Separate Contractor): The Bid Form must include a statement that informs the General Contractor of the intent to perform specific work in a specific location, and directs the General Contractor to allow the work to proceed, and coordinate the work of the owner and other contractors. An example of this is medical equipment.

900.5 Approvals, Equals, and Substitutes

900.5.1 Approvals and/or Submittals Prior to Bidding: The Bid Documents **shall not** require samples, shop drawings, or similar materials to be submitted for approval prior to receipt of bids. See Section 26 of the General Conditions of the Construction Contract.

900.5.2 Approvals of Submittals: The specifications must contain sufficient information to describe to the contractor and bidders the performance and quality standards that will be used to evaluate the submittals.

900.5.3 Brand Names: Unless otherwise stated in the specifications, the name of a certain brand, make or manufacturer denotes the characteristics, quality, workmanship, economy of operation and suitability for the intended purpose of the article desired, but does not restrict bidders to the specific brand, make, or manufacturer. The brand names are shown to convey to the Contractor the general style, type, character and quality of article specified. When brand names are listed in the specifications, the Manual requires that three (3) brands with model numbers be listed.

900.5.4 Equal materials, equipment or assemblies: Any brand, make or manufacturer of a product, assembly or equipment which in the opinion of the A/E is the equal of that specified, considering quality, capabilities, workmanship, configuration, economy of operation, useful life, compatibility

with design of the work, and suitability for the intended purpose, will be accepted unless rejected by the Owner as not being equal. See Section 26 of the General Conditions of the Construction Contract.

900.5.5 Substitute materials, equipment or assemblies: The General Conditions permit the Contractor to propose a substitute or alternate material, product, equipment, or assembly which deviates from the requirements of the Contract Documents but which the Contractor deems will perform the same function and have equal capabilities, service life, economy of operations, and suitability for the intended purpose. Examples of substitutes or alternates include proposing to substitute "precast concrete" for "cast-in-place concrete" floors or to substitute "precast concrete panels" for "masonry" walls. The Contractor's proposal must include any cost differentials proposed. The Owner would have the A/E provide an initial evaluation of such proposed substitutes to include a recommendation on acceptability and indicate the A/E's redesign fee to incorporate the substitution in the design. If the proposed substitute is acceptable to the Owner, a Change Order would be proposed to the Contractor to accept the substitute and to deduct the cost of the A/E redesign fee and the proposed cost savings from the Contractor's Contract amount. The Owner will have the right to limit or reject substitutions at its sole discretion. See Section 26 of the General Conditions of the Construction Contract.

900.6. Unit Prices

Certain aspects of construction projects, such as the depth to suitable foundation bearing for footings, piles or caissons, or the locations and amount of rock to be encountered and removed often must be estimated based on limited factual data. In such situations, to ensure fairness for the Owner, the Bidders and the successful bidding Contractor, estimated quantities are shown for unit pricing and determining the low bidder. A statement is included on the Bid Form stating that actual quantities will be measured for the listed work and that the Contract Price will be adjusted upward or downward by change order to reflect the actual quantities involved times the Contractor's unit price shown on the Bid Form (unless such prices have been modified by the Contract). See Standard Bid Form Format in Appendix C.

Where unit prices are used to competitively bid work which may vary depending on actual conditions encountered, the following method shall be used:

1. The A/E shall provide on the Bid Form the unit price schedule to include an estimated quantity of each work task or material listed. The estimated quantities should be reasonably accurate based on the best available information and the designers experience and judgment.
2. The bidders insert the unit prices for each and extend the estimated quantity times unit price to yield a cost.
3. The extended costs will then be added to the base bid for other work to give a total base bid.
4) A statement shall be included on the Bid Form stating that the payment for work listed in the unit price schedule will be based on actual quantities of listed items required for completion of the work.

Example of Unit Price Method and Wording

Base Bids for Parts C, D and E shall be based on the estimated quantities indicated to be provided complete and in accordance with the applicable portions of the plans and specifications. Payment amounts for each of these items will be based on the actual quantities authorized, provided and approved times the unit costs indicated by the bidder. The final contract amount shall be adjusted upward or downward based on the actual payment amounts versus the bid amounts for PARTS C, D and E.

Part C. - Excavation of Additional Unsuitable Material

Excavation of unsuitable material, where authorized or directed, below the levels required for the Work in Parts A and B and backfill with compacted material per specifications. (price per cubic yard) (Final amount shall be adjusted upward or downward based on actual quantity authorized)

Estimated quantity of *150* cubic yards @ $ _____ per cubic yard = _____
(A/E fills in estimated quantity to be included in bid)

Part C = _____ Dollars $

Part D. - Piling (Example for Timber Piling)

Timber piling provided complete in place in accordance with the plans and specifications (Priced per each pile at the indicated length):

40' Timber Piling	*60* ea @ $	ea = $
30' Timber Piling	*20* ea @ $	ea = $

Part D = _____ Dollars $

Part E. - Caissons (Sample for Caisson Foundations)

Cast-in-place concrete caissons complete in place in accordance with the plans and specifications (Priced per linear foot of caisson complete and accepted for each caisson diameter):

36 inch Diameter	*250* linear feet @ $	/ linear feet =$
48 inch Diameter	*175* linear feet @ $	/ linear feet =$

Part E = _____ Dollars $

900.7 Procurement of Furnishings and Loose Equipment

Loose equipment and furnishings are generally items moveable or portable versus permanently installed. It includes such items as fire extinguishers, but not fire cabinets; residential refrigerators; unattached residential stoves; unattached furniture; and other similar furnishings or loose equipment. The Agency shall purchase loose equipment using the procedures described in the Agency Procurement and Surplus Property Manual published by the Division of Purchases and Supply and the **eVA** procurement process.

900.8 Built-In Equipment

Built-in equipment comprises special purpose equipment or furnishings which are permanently built in or attached to general building construction. It includes such items as laboratory fixtures, kitchen cabinets, commercial laundry equipment, auditorium seating, stage rigging, and so forth. Built-in equipment may be procured in the following ways provided the procurement complies with Chapter 43, Title 2.2 of the Code of Virginia:

(1) Bid the Built-in equipment as part of the Construction Contract.

(2) Bid prior to receipt of bids on the Construction Contract where the successful bidder agrees to be assigned as a subcontractor to the Construction Contractor. That price and vendor's name are then listed on the Bid Form using wording as shown on the Sample Bid Form in Appendix J for inclusion in the Construction Contract bids.

(3) Bid the Built-In Equipment to be furnished and installed, with or without assistance from DPS, as a separate contract for both procurement and installation.

900.9 Plans, Sections and Details of Equipment or Systems

900.9.1 The drawings shall have sufficient plans, sections and details to generally indicate the intended equipment or system configuration in the space. Recognizing that it is often necessary to use some piece of equipment as a basis for designing, dimensioning and detailing, the drawings (but not the specifications) may be noted to indicate that the A/E has designed or detailed around a particular brand of equipment. In doing so, the A/E shall ensure that there is adequate space, capacity, etc., available to accommodate the other brands indicated in the specifications. See Section 803.5 for requirements concerning the use of brand names and models.

900.9.2 Where a particular manufacturers product is indicated as the basis for design/detail, the following statement shall be placed on the drawing with appropriate noting/references:

"The design/detail/section shown is based on (manufacturer, model) equipment and is intended only to show the general size, configuration, location, connections and/or support for equipment or

systems specified with relation to the other building systems. See specification Section xxx for technical requirements pertaining to the equipment."

Section 900.10 Project Reviews Entities

Many agencies and/or entities other than BCOM have been given authority to establish regulations or standards and/or to review projects for conformance with their requirements. The following is a listing of the usual agencies or entities that may have some authority over a project, depending on its scope of work. The Agency and it's A/E are responsible for determining which agencies or entities are applicable and for complying with their requirements.

Art & Architectural Review Board (AARB)
Code of Virginia Section 2.1-488.1

Local Officials
Code of Virginia Section 15.2-2202.C

Asbestos & Lead (DLI)
NESHAP, 40CFR Part 61
AHERA, 40CFR Part 763
Virginia Reg. VR 630-3-442

Underground & Above Ground Tanks (DEQ)
Virginia Reg. VR 680-13-02 USTS
Virginia Reg. VR 680-14-12 AST
Virginia Reg. VR 680-14-07 AST
Virginia Reg. VR 680-14-13 AST

Erosion & Sediment Control (DCR)
Code of Virginia Section 10.1-560
Virginia Reg. VR 625-02-00

Storm Water Management (DCR)
Virginia Reg. VR 215-02-00

Chesapeake Bay Preservation Act (CBLAD)
Virginia Reg. VR 173-02-01

Building Permits (DEB)
Virginia Uniform Statewide Building Code

Special Inspections (DEB)
Uniform Statewide Building Code

Air Division Permitting (DEQ)

Water Division Permitting (DEQ)
Virginia Reg. VR 173-02-01

U.S.Army Corp of Engineers Permits
Wetlands Management (Federal Regulation)

Department of Health
Dining Facilities
Septic Systems

Department of Social Services
Hospital Facilities
Child Care Centers

Dept of Criminal Justice Services
Code of Virginia Section 9-183

Davis-Bacon Wage Rates
Associated with Federal Aid Projects

Department of Historic Resources
Section 4-4.01.p; Appropriation Act

Handicapped Accessibility
Americans with Disabilities Act-1990 (ADA 90)
Uniform Federal Accessibility Standards (UFAS)f

Environmental Impact Report
Code of Virginia, Section 10.1-1188

901.0 SPECIAL BUILDING PLANNING REQUIREMENTS

901.1 Method of Determining Building Area and Volume

901.1.1 Building area and volume calculations are required by the Division of Engineering and Buildings and the Department of Planning and Budget for establishing project scope and for evaluation of the cost estimates.
901.1.2 New Construction: Building area and volume are calculated in units of total gross square feet and total gross cubic feet, according to the guidelines listed below.

901.1.2.1 Building area shall be calculated according to Figure 901.1.1.

901.1.2.2 Building volume shall be the sum of the volume of all levels calculated by multiplying the floor area as calculated according to Figures 901.1.1 and 901.1.2 at each level by the distance between the base floor level of successive floors. At the top level the floor area shall be multiplied by the distance between the top floor and average height to the top of roof surfaces (excluding parapets and other minor roof projections). Volumes for buildings with varying roof heights are calculated by the same method, but separately, under each roof and then summed.

901.1.2.3 Piling, foundations and power plant exhaust stacks are not included in area and volume calculations. When performing cost estimates, list costs for these items separately.

901.1.3 Renovations: Calculation of the building area for renovation work within existing buildings shall include only spaces where physical alterations are to be made.

901.1.3.1 Use the actual area for each space renovated, at least 70% of the entire floor or ceiling surfaces are being altered in which case the entire floor area would be used.

901.1.3.2 Plumbing, HVAC and/or electrical systems work is calculated on the basis of the area modified or served. An example would be: HVAC or lighting modifications to serve 300 square feet of floor area would calculate at 300 square feet. Plumbing modifications to a toilet space would calculate in the area of the whole toilet room.

901.1.3.3 Building volume calculations for renovation work are not required unless specifically requested by BCOM to confirm conformance with the authorized project scope..

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DESCRIPTION	ADJUSTMENT FACTOR *		REMARKS
	6'-8" OR GREATER CLEAR HEIGHT	LESS THAN 6'-8" CLEAR HEIGHT	
INTERIOR SPACES:			
(WHETHER FINISHED OR UNFINISHED)			SEE SECTION 910.1 FOR PROCEDURES FOR CALCULATING RENOVATED AREAS AND
- GENERAL FLOOR AREAS	1.0	0.5	BUILDING VOLUME.
- BASEMENTS	1.0	0.5	MINOR INTERRUPTIONS OF CLEAR HEADROOM
- PENTHOUSES/MEZZANINES	1.0	0.5	HEIGHTS LESS THAN 6'-8" ARE CALCULATED
- INTERMEDIATE FLOORED TIERS/INTERSTITIAL SPACES	1.0	0.5	AT FULL GROSS AREA.
- ATTICS AND CRAWL SPACES:			
- SPECIFIC AREAS INTENDED FOR CURRENT OR FUTURE USE AS: HABITABLE SPACE, STORAGE SPACE, OR AREAS FOR MAJOR EQUIPMENT	1.0	0.5 0.0	for ATTICS for CRAWL SPACES
- NOT INTENDED FOR CURRENT OR FUTURE USE DESCRIBED ABOVE, i.e., SPACE WILL ONLY CONTAIN STRUCTURAL OR SERVICE SYSTEMS (PIPING, DUCTS, CONDUIT, ETC.)	0.0	0.0	
- UTILITY AND SERVICE TUNNELS	1.0	0.5	ONLY INCLUDE PORTIONS OF TUNNELS WITHIN THE FOOTPRINT OF THE BUILDING PROPER.
- MULTI-STORY SPACES:			
- AUDITORIUMS	1.0	N/A	AREA FOR THESE SPACES TO BE CALCULATED
- THEATERS	1.0	N/A	AT ONE LEVEL ONLY, i.e., THE ACTUAL
- GYMNASIUMS	1.0	N/A	FLOOR LEVEL.
- OTHER MULTI-STORY SPACES	1.0 (each level)	N/A	AREA FOR SPACES OTHER THAN LISTED ABOVE SHALL BE CALCULATED AT ALL LEVELS THE SPACE PENETRATES MORE THAN 6'-8"
- VERTICAL OPENINGS			NO DEDUCTIONS SHOULD BE MADE FOR THESE
- INTERIOR STAIRS	1.0	0.5	VERTICAL OPENINGS, i.e., THEY SHOULD BE
- ELEVATOR SHAFTS/ESCALATOR OPENINGS	1.0	0.5	COUNTED THE SAME AS GENERAL FLOOR
- UTILITY/SERVICE SHAFTS & SIMILAR OPENINGS	1.0	0.5	SPACE.
- OTHER LIKE AREAS	1.0	0.5	
EXTERIOR SPACES:			**EXAMPLES:**
- NOT COVERED	0.0	0.0	PATIOS, COURTYARDS, UNCOVERED WALKWAYS UNCOVERED TERRACES, UNCOVERED ENTRY STEPS, UNCOVERED AREAWAYS, DECKS.
- COVERED, BUT UNSURFACED (i.e., NO CONCRETE, PAVING, GRAVEL OR SIMILAR SURFACE)	0.0	0.0	AREAS UNDER TYPICAL ROOF OVERHANGS
- COVERED AND SURFACED	1.0	1.0	COVERED WALKS, CANOPIES OVER PAVED AREA, COVERED BALCONIES, PORCHES, PORTICOS, COVERED ENTRIES, COVERED TERRACES, COVERED AREAWAYS.
- EXTERIOR STAIRS	1.0	1.0	CALCULATE GROSS AREA AT EACH COVERED
- ROOF TERRACES - COVERED OR NOT COVERED	1.0	1.0	AREA

* - FACTOR TO BE APPLIED TO ACTUAL MEASURED AREA TO COMPUTE GROSS AREA

GENERAL NOTES:

1 THE GROSS BUILDING AREA IS THE SUM OF ALL MEASURED AREAS ADJUSTED BY THE APPROPRIATE FACTORS NOTED ABOVE.

2 GROSS AREAS SHALL BE MEASURED FROM OUTSIDE FACE TO OUTSIDE FACE OF EXTERIOR WALLS OR FROM THE CENTERLINE OF COMMON WALLS SEPARATING BUILDINGS.
(OPEN-SIDED EXTERIOR SPACES SHALL BE MEASURED TO THE OUTSIDE EDGE OF THE COVERED SURFACE.)

3 THE OUTSIDE OF THE EXTERIOR WALL IS DEFINED AS THE "NEAT" OUTSIDE PERIMETER LINE OF THE EXTERIOR WALL FACE AS TAKEN AT EACH FLOOR LEVEL. NO DEDUCTION SHOULD BE TAKEN FOR SETBACKS AT WINDOWS, GLAZING, AND THE LIKE, NOR SHOULD ADDITIONS BE MADE FOR PROTRUSIONS SUCH AS PILASTERS, COLUMN ENCLOSURES, CORNICES, EXTERIOR BANDS, ETC.

4 SLOPING OR STEPPED FLOORS SHALL BE MEASURED AT THEIR FLAT HORIZONTAL PROJECTION.

Gross Building Area – Method of Computation

Figure 901.1.1

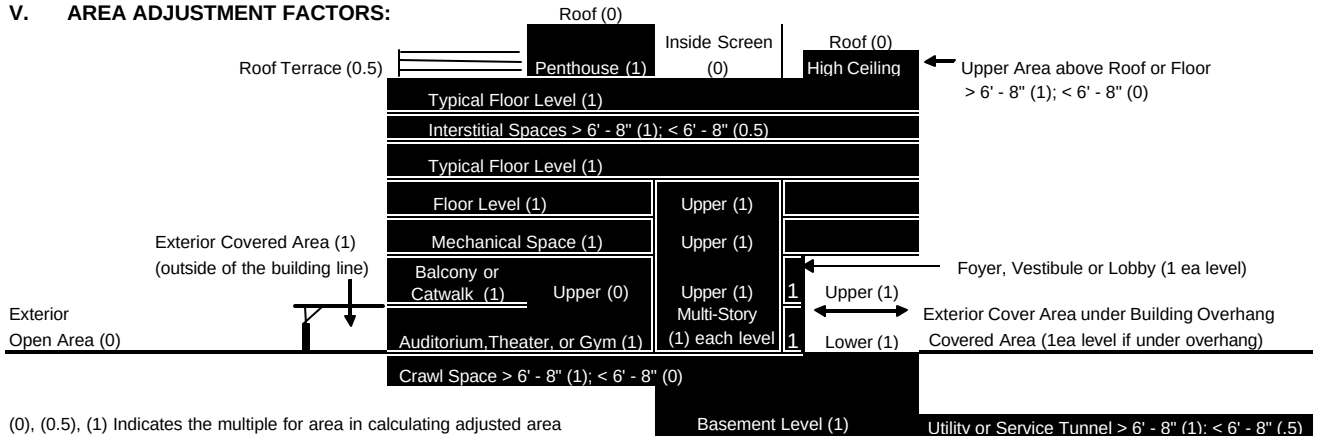
I. INTERIOR BUILDING SPACE	Area With Clear Height > 6'-8" a	Area With Clear Height < 6'-8" b	Area With Clear Height < 6'-8" (Adjusted) c = b x 0.5	Total Adjusted Area d = a + c	Assignable Area e	Non-assign Area f = d - e
- CRAWL SPACE						
- BASEMENT FLOOR						
- FIRST FLOOR						
- SECOND FLOOR						
- THIRD FLOOR						
- ADDITIONAL FLOOR LEVELS						
- ATTICS AND PENTHOUSES						
- INTERMEDIATE TIERS/INTERSTITIAL SPACES						
- CATWALKS						
- UTILITY AND SERVICE TUNNELS						
GROSS BUILDING AREA AND COST ESTIMATE AREA						

II. BUILDING EFFICIENCY FACTOR =

III. EXTERIOR SPACE	Measured Exterior Area	Adjustment Factor	Adjusted Exterior Area
- COVERED			
- ROOF TERRACE			
- EXTERIOR STAIRS			
SUBTOTAL OF EXTERIOR SPACES			

IV. TOTAL AREA FOR PROJECT SCOPE FORMS (CO-2, CO-5, C0-6 etc) (I + III = IV)

V. AREA ADJUSTMENT FACTORS:



(0), (0.5), (1) Indicates the multiple for area in calculating adjusted area

Area Calculation for Gross Building Area, Building Efficiency and Cost Estimates

(continued on next sheet)

Figure 901.1.2

VI. NOTES

1) ATTIC & CRAWL SPACE AREA INTENDED FOR USE (CURRENT OR FUTURE) AS HABITABLE SPACE, STORAGE SPACE, OR AREA OCCUPIED BY MAJOR EQUIPMENT SHALL BE INCLUDED IN THE GROSS AREA IF > 6' - 8" IN HEIGHT.

2) PROJECT SCOPE SHALL INCLUDE THE EXTERIOR COVERED AND SURFACED SPACE OUTSIDE OF THE BUILDING LINE AS: COVERED WALKS, CANOPIES OVER PAVED AREAS, COVERED BALCONIES, PORCHES, PORTICOS, COVERED ENTRIES, COVERED TERRACES AND THE LIKE.

3) THE LOWEST LEVEL OF THE MULTI-STORY SPACE SHALL BE COUNTED IN THE INTERIOR SPACE FOR THAT LEVEL. ANY SPACE THAT PENETRATES THE FLOOR OR ROOF LEVEL BY > 6'-8" SHALL BE COUNTED AS ADDITIONAL AREA/ FLOOR LEVEL EXCEPT AREA FOR MULTI-STORY SPACES AS AUDITORIUM CHAMBER, THEATER, AND GYMNASIUMS SHALL BE CALCULATED AT ONE LEVEL ONLY.

4) AREA FOR VERTICAL OPENINGS AS INTERIOR STAIRS, ELEVATOR SHAFTS, ESCALATORS, UTILITY/SERVICE SHAFTS AND SIMILAR OPENINGS SHALL BE COUNTED AS GENERAL FLOOR SPACE ON EACH FLOOR THEY PENETRATE.

5) GROSS AREAS SHALL BE MEASURED FROM OUTSIDE FACE TO OUTSIDE FACE OF EXTERIOR WALLS OR FROM THE CENTERLINE OF COMMON WALLS SEPARATING BUILDINGS. (OPEN-SIDED EXTERIOR SPACES SHALL BE MEASURED TO THE OUTSIDE EDGE OF THE COVERED SURFACE.)

6) THE GROSS BUILDING AREA IS THE SUM OF ALL MEASURED AREAS ADJUSTED BY THE APPROPRIATE FACTORS NOTED ABOVE.

7) THE OUTSIDE OF THE EXTERIOR WALL IS DEFINED AS THE "NEAT" OUTSIDE PERIMETER LINE OF THE EXTERIOR WALL FACE AS TAKEN AT EACH FLOOR LEVEL. NO DEDUCTION SHOULD BE TAKEN FOR SETBACKS AT WINDOWS, GLAZING, AND THE LIKE, NOR SHOULD ADDITIONS BE MADE FOR PROTRUSIONS SUCH AS PILASTERS, COLUMN ENCLOSURES, CORNICES, EXTERIOR BANDS, ETC.

8) SLOPING OR STEPPED FLOORS SHALL BE MEASURED AT THEIR FLAT HORIZONTAL PROJECTION.

**Area Calculation for Gross Building Area,
Building Efficiency and Cost Estimates**

(continued from previous sheet)

Figure 901.1.2

901.2 Guidelines for Office Space Planning:

These guidelines are used for evaluating areas of common types of spaces. The guidelines are included in the Manual to help in planning space sizes and for calculating and justifying Capital Budget Requests space and area requirements. In the actual design of the project the agency may choose to make some spaces larger than the indicated guideline area and compensate by reducing the area allocated to other spaces. The use of areas greater than those indicated are not considered to be a valid justification for an increase in the authorized project square footage. Spaces which exceed the guidelines, any special space needs or special features required may need further explanation or justification in the Basis of Design.

Space Category &Type of Room or Space	Area Guideline	Remarks
Offices		
Agency Head	256 sf	16' x 16'
Deputy Agency Head	192 sf	12' x 16'
1st Level Below Agency Head	168 sf	12' X 14'
2nd Level Below Agency Head	144 sf	12' X 12'
3rd Level Below Agency Head	120 sf	12' X 10'
Private	120 sf	12' X 10'
Semi-private	96 sf	per person
Cubicle	64 sf	per person
Open Plan	64 sf	per person
Examining Room	110 sf	10' X 11'
Testing Room	100 sf	10' X 10'
Interview Area	64 sf	per person
Clerical Area	64 sf	per person
Conference Room	15 sf	per person
Assembly / Auditorium, Meeting, Theater, Lecture Hall/Room		
Fixed Seats (incl. aisle space)	10 sf	per seat
Chairs, not fixed	10 sf	per person
Tables and Chairs	15 sf	per person
Standing/Observation Space	3 sf	per person
Educational Spaces		
Classroom, 10 - 49 stations	20 sf	per station
Classroom, 50 - 99 stations	15 sf	per station
Lecture, over 100 stations	10 sf	per station
Laboratory, Biology & Chemistry	45 sf	per station
Laboratory, Engineering	60 sf	per station
Laboratory, Physics or Geology	40 sf	per station
Laboratory, Art & Architecture	60 sf	per station
Lab Storage, Biology & Chemistry	10 sf	per station
Lab Storage, Engineering	10 sf	per station

Lab Storage, Physics or Geology	8 sf	per station
Lab Storage, Art & Architecture	10 sf	per station
Dormitory		
Bedroom	115 sf	per bed
Lounge & Recreation Space	25 sf	per bed
Storage Space	10 sf	per bed
Library		
Stack Space	0.08 sf	per book
Reading Space	10 sf	per user
Library Services	2.5 sf	per user
Food Service, Food Courts, Dining Halls		
Dining Areas	15 sf	per seat
Serving Line and Counters	1.5 sf	per seat
Kitchen and Food Preparation	2.5 sf	per seat
Food Storage	1.5 sf	per seat
Dishwashing Area	0.7 sf	per seat
Receiving Area	0.4 sf	per seat
Waste or Garbage Area	0.3 sf	per seat
Recreation Buildings		
Bleacher Seats	5 sf	per person
Locker Area	20 sf	per locker
Weight Room	50 sf	per station
Exercise and Aerobics Area	20 sf	per person

Note: These guidelines shall not be used for calculating maximum occupancies for spaces or occupancy for egress!

901.3 Building Efficiency Ratios

901.3.1 General: Building efficiency is the ratio of Assignable Area to Gross Building Area expressed as a percentage and is determined based on the definitions and calculation procedures shown below. The minimum building efficiency ratios are a composite of the ratios or factors taken from recognized standards and are based on the definitions and procedures shown below. The minimum building efficiency ratios are intended to provide achievable minimum standards for design of an efficient, functional layout.

The definitions and procedures described below shall be used to determine the "Building Efficiency Ratio". Note that the "Gross Area" used in determining Building Efficiency differs from the VUSBC definition of gross area for determining the allowable gross area for the building for code compliance.

(Higher Education Agencies should note that the SCHEV guidelines for determining space needs or justification considers not only the assignable space (classroom, laboratory, etc.) but also all spaces which directly serve that space as being part of the "program space". Likewise, the SCHEV area and use factors for "program space" are based on their definitions without regard to actual layout.)

901.3.2 Definitions

Gross Area: The sum of all floor areas of the building included within the outside faces of the exterior walls for all stories. This includes the spaces that have floor surfaces as well as the open space in the floor for shafts, atriums and such. For determining building efficiency, the area of openings in the floor at each level for shafts and atria shall be in the gross area calculation at full value of the area of each opening.

Assignable Area: The area or the sum of all areas on all floors of a building assigned to, or available for assignment to, an occupant, including every type of space functionally usable by an occupant excepting those non-assignable areas defined below. The area of a closet or private toilet within an office or suite space shall be included in the calculation of the assignable area of that space. Assignable square footage shall include only program-related spaces; however, not all program related spaces are necessarily considered assignable.

Non-assignable Area: The area or the sum of all areas on all floors of a building not available for assignment to building occupants but which are necessary for the general operation of the building. Non-assignable space areas include corridors, stairs, lobbies, foyers, atria, entry vestibules, walls, columns, elevators, mechanical shafts, toilets (common and public), janitors closets, custodial, circulation, mechanical, HVAC and utility spaces, structural areas and open (shaft and atrium) spaces.

Custodial Area: That portion of the non-assignable area which is the sum of all areas of the building used for its protection, care, and maintenance. These include janitors closets, storage areas for custodial supplies and equipment, trash rooms, and custodial locker rooms.

Circulation Area: That portion of the non-assignable area which is required for physical access to other spaces, whether directly bounded by partitions or not. Circulation space includes corridors, elevator shafts, stairways, loading platforms, entry vestibules, foyers, atria, lobbies, tunnels and bridges. When determining circulation area, only spaces required for general access should be included. Aisles which are used for circulation within open office suites, auditoriums and other work areas are included in the calculation of the assignable area.

Mechanical Area: That portion of the non-assignable area designed to house mechanical/HVAC equipment, mechanical shafts, plumbing and sprinkler risers, electrical equipment rooms / closets, telephone and communications equipment rooms / closets, other utility services, and common or public (non-private) toilet facilities.

Structural Area: That portion of the non-assignable area which cannot be occupied or put to use because of the presence of structural features of the building. Included are columns, exterior walls, fire walls, and permanent partitions.

901.3.3 Calculations: The areas shall be determined from the actual floor plans for the facility. Section 701A further describes the factors and methods for calculation of floor areas.

Assignable square feet (ASF) as a percentage of gross square feet (GSF) shall be no less than the ratios listed below. Exceptions to these building efficiency factors must be approved by the Director of the Department of General Services. Requests must be supported by written justification submitted by the agency stating why these ratios cannot be obtained.

901.3.4 Building Efficiency Ratios

Building Type	**Ratio: ASF to GSF**
Office Building w/partitioned offices	70%
Office Building w/open office layout	90%
Classroom Building	66%
Classroom & Office Building	66%
Health/Fitness Building with gymnasium & classrooms	85%
Health/Fitness Building (gyms, classrooms, pool, handball courts)	80%
Hospital or Infirmary	60%
Engineering/Laboratory Building	72%
Instructional Shop Building	90%
Library Building	75%
Fine Arts Building	72%
Science Building w/Laboratories	65%
Physical Plant Service Building	85%
Student Union	75%
Dormitory Housing w/ common use toilets	65%
Apartment or Townhouse Style Housing	90%

Suite Style Housing w/ private toilets	80%
Auditorium / Theater	70%
Dining Facility	72%
Warehouse	93%
Maintenance Garage	85%

901.4. Energy Conservation Guidelines for Design and Operation

The following guidelines shall be considered by the Agency and the A/E when developing the criteria for the design and operation of the facility.

901.4.1 Architectural

- Comply with Mechanical Design Standards for energy conservation in Section 715A
- Reduce electrical energy consumption within the building by using natural light. Locate windows high in wall to increase ceiling reflection, where practicable.
- Use light color materials for walls and ceiling.
- Use adequate insulation and light colored or reflective roof surface.

901.4.2 Heating Ventilation and Air Conditioning

- Use activated charcoal filters or other efficient systems as approved by BCOM when odor control is required.
- Evaluate heat recovery; employ when economically feasible.
- Use hot and chilled water temperature reset controls.
- Size pumps, fans, chillers etc. to design load; do not oversize.
- Use variable speed drives on VAV fans.
- Use electric ignition instead of pilots.

- Provide means to shut-off HVAC distribution to unoccupied areas. Exceptions will be granted to hospitals, health care facilities, and other specialized construction, i.e., labs, computer rooms etc..

- Avoid the use of reheat systems.

- Use primary/secondary pumping and/or variable volume pumping.

- Avoid supplying simultaneous heating and cooling to a zone.

- Evaluate the use of energy management control and/or direct digital control systems.

- Evaluate thermal storage for electrical demand reduction, if current utility rates justify this technology.

- Evaluate the potential for co-generation.

- Evaluate the use of high efficiency, ground coupled, water source (geothermal) heat pumps.

901.4.3 Domestic Hot Water / Domestic Water

- Provide temperature control devices and time clocks for domestic water heaters.

- Consider instantaneous units for heating domestic hot water.

- Maximum water use rates for shower heads, faucets, water closets and urinals shall meet the requirements of the USBC.

- The use of domestic water for process cooling requires the approval of the Director of BCOM.

901.4.4 Electrical

- The levels of illumination, as recommended in Section 916.3 of this Manual, shall be used as the basis for designing maintained foot candle levels in applicable areas. Overall watts per gross square foot shall be no higher than 2.5 watts/gross square foot.

- Specify efficient lighting sources, e.g., reflective, electronic ballast, metal halide, etc.. Increased first cost shall be weighed against reduced operational and maintenance costs. See Section 916.4.

- Switching shall be provided for each lighting circuit, or for portions of each circuit, so that the partial lighting required for custodial, or for effective complementary use with natural lighting, may be operated selectively.

- In order to minimize energy usage during unoccupied hours, no lighting shall be installed that cannot be readily controlled (including emergency lighting intended to be controlled by authorized personnel only). The number of emergency lights shall be limited to the minimum required by the Virginia Uniform Statewide Building Code.

- Outside lighting shall be for security purposes only.

- Corridor and lobby lighting, as well as in other areas, should be reduced without going below established standards.

- The effect of total connected load, with respect to demand and energy rate schedules, shall be evaluated in the selection of all lighting and mechanical equipment. All available rate schedules shall be analyzed.

- Design switch circuits to permit turning off unused lights.

- Avoid the use of incandescent lighting.

- Control exterior lighting with photocells and time clocks.

- Motor shall conform to the requirements of Section 716.E.

901.4.5 Operational Criteria for Design

To comply with the ongoing program of energy conservation, the A/E shall incorporate into the design the ability to conform to the following operational criteria.

901.4.5.1 Heating Season:

(1) Set control devices so that full heating capacity of the system is not delivered to a space above 68°F space temperature, unless health reasons or programmatic reasons dictate higher requirements.

(2) During occupied hours, the temperatures of unoccupied spaces shall be reduced to at least 63ºF.

(3) During unoccupied hours, no heat shall be supplied to a building if the outside temperature is greater than 55ºF.

(4) During unoccupied hours and if the outside temperature is less than 55ºF., controls shall be set to supply heat to the extent that the space temperature shall not exceed 55ºF except during warm up of the space in a reasonable period of time.

(5) Adjust dampers so as to reduce to a minimum the induction of cold outside air into the heating system, and do not operate exhaust systems when buildings are unoccupied or during warm-up periods.

(6) Blinds, shades, drapes or other window coverings should be kept closed at night in order to reduce the heat loss through windows. Advantage should be taken of the suns heat by opening window coverings to admit sunlight when available.

901.4.5.2 Cooling Season:

(1) Set control devices so that full cooling capacity of the system is not delivered to a space below 78ºF. space temperature, unless health reasons or programmatic reasons dictate lower requirements.

(2) When spaces are not in use, space temperatures shall not be maintained below 83ºF by use of cooling cycle or ventilating equipment.

901.4.6 Facilities Operational Procedures

To comply with the ongoing program of energy conservation, the Agency shall incorporate the following operational procedures.

- It is imperative that windows and outside doors be kept closed when heating or cooling is required.

- Turn off heating equipment and close doors to spaces that are unoccupied for several hours.

- Central steam heating systems must be inspected on a continuing basis and all traps, expansion joints and other equipment repaired and maintained to prevent leaks both in distribution systems and in the buildings.

- Maintenance forces should regularly inspect and properly maintain the temperature controls to assure proper functioning.

- All systems carrying hot water, such as condensate returns, hot water heating systems, and domestic hot water systems, with particular emphasis on unions, valve stems and faucets, should be inspected and leaks repaired.

- The use of supplemental heating units, such as plug-in heaters, shall be avoided.

- Do not operate air conditioning equipment in spaces that will be unoccupied for several hours.

- When possible, reduce the amount of outside air brought through the cooling equipment.

- Use lights only when necessary since lights produce heat and add to the cooling load.

901.5 LEADERSHIP in ENERGY & ENVIROMENTAL DESIGN (LEED)

The U. S. Green Building Council (USGBC), a group of persons and other entities in the building industry promoting buildings that are environmentally responsible, profitable, and healthy places to live and work, has developed the LEED Green Building Rating System for evaluating sustainable concepts incorporated in the building and site developments.

The General Assembly in House Joint Resolution 108 encourages State Agencies and their A/E Designers to recognize and incorporate the Energy, Environmental, and Sustainability concepts listed in the LEED Green Building Rating System that are reasonable and feasible into the development and procurement of their projects.

The Department of General Services, Division of Engineering and Buildings, encourages that LEED sustainable development concepts and principles be considered in the planning, programming, design, construction, operation and maintenance, sustainment, restoration, and modernization of all Capital Projects to the extent such concepts are feasible, reasonable and consistent with its mission, program, functionality, project budget, the Uniform Statewide Building Code, the DEB Building Standards in the CPSM, the Governor's Executive Orders and policies, and the intent of the Virginia Public Procurement Act (§2,2-4300 et seq, Code of Virginia, as revised).

The USGBC LEED Green Building Rating System (http://www.leedbuilding.org) may be useful as a tool in identifying sustainable development principles and evaluating sustainability achieved thru the planning, design and construction process.

LEED Certification is an expense over and above the normal first cost of the project development. Agencies and Designers are encouraged to incorporate LEED energy, environmental and sustainability concepts into its projects. Pursuing the actual LEED Certification of the project and all associated expenses are left to the discretion of the Agency.

901.6. Design Checklist for Crime Prevention

The following checklist of items was provided by the Department of Criminal Justice Services (DCJS) to assist agencies in planning for safer campuses. Contact DCJS at (804) 786-4000 for additional information or assistance.

Street and Site Planning

1. Would any areas adjacent to the site be likely to cause a crime problem?

2. Is the site located adjacent to streets that have a relatively high degree of traffic at all hours?

3. Are the streets laid out in a manner to facilitate police and emergency vehicles?

4. Are streets straight and wide enough for effective patrol observation?

5. Does the site have only the minimum number of streets entering it, which could be blocked, secured or controlled if required?

6. Can access roads be provided to reservoirs and similar remote structures to permit maximum patrol observation?

7. Is adequate lighting provided along pedestrian and vehicular circulation systems?

8. Can the high-volume activities be located close to the patrol observation points?

9. Do vehicular and pedestrian circulation patterns maximize social deterrents to crime by enhancing intra-neighbor observation and recognition?

10. Are areas where crowds congregate designed so that police units can readily patrol?

11. Are structures sited to facilitate patrol observation and allow patrol access to all sides?

12. Are structures set back sufficiently from the perimeter street to deter the casual passerby from entering? Are signs used to denote territory or ownership?

13. Are dwelling units clustered into small groups which are removed from throughways, making strangers in each cluster more obvious?

Parking

1. Is sufficient off-street parking provided so streets may be cleared at night?

2. Can parking area be easily observed easily from the street? Does landscaping provide concealment?

3. Can the parking lot be at a lower grade than the surrounding streets, enabling a patrol to look down on it without unduly hampering design problems and increasing site development costs?

4. Is the parking for night activities located adjacent to the activity centers to reduce isolation?
5. Is the parking structure located away from the rest of the buildings in the area, so it does not provide access to the roofs of any of the adjoining buildings? Is the grade level fenced/secured?

6. Can parking areas be secured when not in use?

7. Is the off-street parking area in a secure place with an access control device which limits entrance and exit from the area to authorized persons?

8. Will parking be secured by a chainlink fence?

9. Are parking stalls laid out to permit maximum observation by patrol, other people or the attendants?

10. Is adequate view of pedestrians provided at vehicular access points crossing pedestrian walkways?

11. Can the attendants station be located to provide maximum observation?

12. Are technological devices needed in the parking area, such as closed-circuit television and sound devices, to provide adequate security? Are metal mirrors provided?

13. Are elevator towers located at the perimeter of the parking structures, adjacent a well traveled walkway or street?

14. Are parking structure stairs and elevator towers designed with at least one glazed wall in each?

15. Is there adequate lighting throughout, with the emphasis on the central areas?

16. Have the advantages of low and high profile lighting been evaluated for this location?

17. Can there be a designated area for parking bicycles or motorcycles?

18. Are bicycle racks in a readily observable area?

19. Are the racks immovable or securable?

Walkways

1. Are the walkways situated to generate enough traffic to provide a deterrent by virtue of the number of people using or observing the walkway at all times?

2. Are there access roads nearby so that emergency vehicles can get relatively close to any point on the walkways?

3. Are they routed past areas where the public is likely to congregate?

4. Are they wide enough to permit clear observation?

5. Are they sufficiently straight to provide adequate observation?

6. Are there any unnecessary indentations that could provide hiding places for would-be assailants?

7. Have the walkways been landscaped in a manner so as to provide minimum concealment for would-be attackers?

8. If they will be utilized at night, are they adequately lighted?

Landscaping

1. Is the landscaping of the type and situated in locations so as to maximize observation, while providing the desired degree of aesthetics? Minimize the use of planting with foliage or screening portion of the plant between 2' to 8' above finished grade.

2. Is lighting used in the landscaping both for security and aesthetics?

3. Are walls/fences planned in a manner so as not to provide concealment for a would-be attacker?

4. Are they set back from sidewalks and walkways?

5. Are walls or fences sufficiently high to deter circumvention?

6. Would it be feasible to use a chainlink fence or a see-through type of fence design, in lieu of a solid material?

Recreational Equipment

1. Are they situated so as to permit clear observation for patrol, free of parked vehicles or railroad cars?

2. Will these storage areas have at least a 50-foot cleared perimeter surrounding them?

3. Is parking provided for equipment away from buildings and fueling facilities so unauthorized vehicles can be readily observed by patrol units?

4. Is the area well lighted?

5. Can chainlink fencing be used instead of solid fences?

6. Can extra security be provided (chainlink fences, especially if pallets are stacked)?

7. If supplies are stacked, is there enough area available so it might be done in a systematic manner, allowing adequate land space for a patrol vehicle?

8. Can access roads be provided along spur tracks to make patrol easier or can they be paved to enable a patrol car to patrol them? If now, is there a possibility of barricading the spur tracks to deter truck or vehicle passage during off hours?

9. Can extra lighting be provided along the spur tracks?

Buildings and Structures

1. Are the buildings planned so that access to one will not give access to other buildings (interconnecting basements and attics)?

2. Are the larger buildings planned so that access to one part of the building does not give access to the entire building?

3. Have all means of gaining access to the roofs been removed (standpipes, flagpoles, trees, etc.)?

4. Are the buildings planned so as to provide no indentations, open courtyards or alleyways which could be used by assailants for concealment?

5. Is there a need for a service entrance? Are service entrances located so they can be seen easily by random patrol? Is it located to provide selective access and not to create an entrance way for criminals into the complex?

6. Can entrances for employees be situated adjacent to their designated parking areas?

7. Are the entrances clearly visible to patrol and the public?

8. Are the number of entrances minimal and, where possible, require passage through some central point, such as a lobby, where a clerk may be on duty? Is the control room designed to permit the maximum area of observation?

9. Are locking systems adequate? Can the entrances be oriented to increase visibility by patrol or neighbors?

10. Are all entrances well lighted?

11. Is it possible to have a multi-story structure? If so, can windows on the first level be eliminated, reduced in number, or made of vandal-proof materials?

12. Are unobservable windows kept to a minimum, especially on the first floor? Are only men housed in first floor dwelling units?

13. Are the windows on the first floor well lighted?

14. Do electrical plans provided for intrusion alarms in the areas of high crime incidents?

15. Are the stairwells open and able to be observed at all times from public areas?

16. Could the elevator use a shaft that would be observable from a public area (a glass shaft on the outside of the building)?

17. Is the elevator equipped with a security alarm button that would sound a silent alarm and automatically send the elevator to the ground floor?

18. Can functional areas be grouped together so they can be secured when not in use?

19. Has the number of like functional units or dwelling units on a corridor been limited to denote a territory and promote observation by neighbors?

20. Are storage areas secure?

21. Has special target hardening consideration been given to the office portion of each building?

22. Are offices located in an area that is readily controlled?

23. Are large areas of non-reflective glass to be used in the walls of laundry, vending and other vulnerable spaces?

902.0 CIVIL & SITEWORK

902.1 Earthwork

The A/E shall consider the recommendations in the geotechnical/soils report in developing the design.

902.1.1 Drawing details of the following conditions will be required:

1 Over-excavation and replacement with suitable materials.

2 Subsurface profiles (boring logs) and limits showing the extent of rock, existing fill materials, water and existing unsuitable bearing materials.

3 Specific drawing notes stating that earthwork details are included in the base bid. Earthwork beyond the extent indicated will be considered for an extra cost, only if necessary and approved by the A/E, and not a result of the contractors failure to maintain site/excavation stability, drainage or protection from frost penetration.

902.1.2 Earthwork specifications shall be definite, not general.

1 Coordinate Specifications with the Drawings.

2 Include a geotechnical/soils report in the Appendix to the Specifications (Project Manual) and a disclaimer stating that the report is not part of the Contract Documents each time this report is referenced.

3 Specifications for materials and instructions shall state whether they are included in the base bid or will be an extra cost item.

4 Rock excavation shall be included in the base bid to the extent that locations are sufficiently identified in the geotechnical/soils report. See Section 702C.

902.1.3 Earthwork specifications shall include soil and aggregate material definitions for all materials used in the project. The soil materials shall be defined by a recognized soil classification system, such as the Unified Soil Classification System or the AASHTO Soil Classification System. The definitions below are by the Unified system. The aggregates shall include gradations required for each material. Note: Unedited master or standardized specifications often are too conservative in defining soil materials - often eliminating the on-site soils as acceptable materials, even for general fill/backfill. Quality control is also often not provided in the form of aggregate gradations. All A/E standard specifications shall be edited to conform to the following requirements.

902.1.3.1 Structural fill/backfill - Generally restricted to GW, GP, GM, SM, SW, and SP unless other materials are specifically approved by the soils engineer or firm that conducted the on-site soils evaluations. SC, CL, and ML might be considered in some situations with the approval of the soils engineer.

902.1.3.2 General fill/backfill - Includes all classifications of materials noted in (a) above.

902.1.3.3 Unsuitable Materials - Includes OL, MH, CH, OH and PT, saturated material which in the judgment of the soils engineer cannot be aerated to be made acceptable, uncompacted fill (for structural bearing conditions), fill with unacceptable quantities of non-soil products, or other materials judged unsuitable by the soils engineer.

902.1.3.4 Aggregates - They may include porous backfill, pipe bedding, underslab fill, any special blend or open-graded material required for a special bearing or drainage use.

902.1.3.5 Moisture content of soil materials - Laboratory tests are generally conducted on samples to determine the maximum density of soils, usually achieved at optimum moisture content. Field conditions during construction prevent attaining and maintaining the optimum moisture content. This requires that a tolerance for departure from this optimum must be specified. This tolerance is generally specified in the range of plus or minus 3% to 5% from the optimum moisture content without significantly affecting the ability to achieve the specified density.

902.1.4 Quality Assurance / Testing: The specifications shall list the tests required to be performed on the Work (i.e. ASTM, AASHTO, VDOT or other test procedures) and stipulate the values to be achieved.

902.2 Erosion and Sediment Control Requirements

902.2.1 **Disturbance of land exceeding 10,000 square feet** (or lesser area if adopted by the Local Soil and Water Conservation District) **requires** submission of an erosion and sediment control plan and narrative to the Department of Conservation and Recreation, Division of Erosion and Sediment Control for approval at the working drawings stage of plan development. Preparation and submission of the plan and narrative shall follow the requirements of the Virginia Erosion and Sediment Control Handbook, latest edition. The transmittal letter to the Division and the approval letter from the Division to the Agency shall be copied to the Bureau of Capital Outlay Management. Approval of the plan shall be secured prior to bid advertisement. Contact the regional or central Division office for clarification of the regulations. [Erosion and Sediment Control Regulation - VR 625-02-00]

902.2.2 **Disturbance of land exceeding one acre requires** submission of a stormwater management plan with calculations to the Department of Conservation and Recreation, Division of Stormwater Management. This is not a substitute for the erosion and sediment control plan, but is an additional requirement to manage the runoff and quality of the stormwater collected on the site. The regional or central Division office should be contacted for information on the required calculations and submissions for approval of the stormwater management plan or clarification of regulations. Approval of the plan shall be secured prior to the bid advertisement. [Stormwater Management Regulations - VR 215-02-00]

902.2.3 **Disturbance of land exceeding five acres requires** a discharge permit issued by the Department of Environmental Quality. This is not a substitute for the erosion and sediment control plan or the stormwater management plan, but an additional requirement. Contact the Department for permit applications and clarification of the regulations. The permit shall be approved prior to bid advertisement.

902.2.4 Plans and Specifications: Requirements shall be included in the specifications to assign to the contractor (as part of the contract) the responsibility of erosion and sediment control and stormwater management at all sites (on or off the owners property) of borrowing, wasting or stockpiling of soil products.

A statement similar to the following shall be used:

"The Contractor shall be responsible for satisfying any and all erosion control (EC) and stormwater management (SWM) requirements for any land disturbing activities, including but not limited to, on-site or offsite borrow, on-site or offsite stockpiling or disposal of waste materials. Before undertaking any land disturbing activity for which the plans do not specifically address erosion control and stormwater management, the Contractor shall contact the Regional Office of the Division of Soil and Water Conservation to determine what EC and SWM measures are necessary. The Contractor shall completely satisfy all requirements of the Division of Soil and Water Conservation before continuing with the concerned activity. The Contractor shall provide on-site, a person certified by DCR as a 'Responsible Land Disturber' in accordance with §10.1-563, Code of Virginia, as revised. "

(Note: This instruction may be added to one appropriate specs section - such as Erosion and Sediment control or Earthwork - with a reference made to that section each time borrow, waste or stockpiling is mentioned in other sections.)

902.3 Rock Excavation

Where rock excavation is likely to be encountered, the site shall have an adequate number of soundings taken. The designer shall use this data to show on the plans enough assumed rock profiles over the entire area to be excavated to identify clearly the condition assumed for the base bid. The specifications shall state the method of volume calculation and pay lines to be used.

The designer shall calculate and state in the Bid Form (See example below) an estimated quantity of rock to be excavated based on the assumed rock profiles. The bidder shall indicate a unit cost by which his bid for the rock excavation is calculated. This bid item shall be added to the other bid items to establish the Lump Sum Bid. The final net contract payment for rock excavation shall be adjusted (plus or minus) based on the actual quantity of rock excavated. This price shall include disposal of excess. General rock pay width shall be based on 18" outside of a neat wall face; or vertical projection from the extremities of the base, whichever is greater. Trench rock quantity shall be based on the widths stated in the specifications.

Rock excavation shall be defined as hard bed rock, boulders or similar material requiring the use of rock drills and/or explosives for removal. The criteria for classification of general excavation as rock shall be that material which cannot be removed by a track mounted D-8 dozer with a heavy ripper or 3/4 CY track mounted shovel with appropriate scoop. The criteria for trench rock shall be that material which cannot be removed by a 3/4 CY track mounted back hoe with a proper width bucket. The trench unit price shall only apply to material below the general grading level.

When the overburden is removed and the rock surface is exposed, the A/E shall verify that the material is of a hardness which qualifies it for classification as rock excavation. Actual profiles shall then be taken. The net difference between the actual rock excavation and that estimated volume shown in the Proposal shall be applied times the contract unit price for adjustment of the final payment.

Examples of Rock Excavation for Bid Form

Part __ - Excavation of Rock Material: Excavation of rock material, where authorized or directed, and proper disposal off-site of excess material, complete per specifications. (price per cubic yard) (Final amount shall be adjusted up/down based on actual quantity authorized.)

Estimated quantity of 100 cubic yards @ $ _____ per cubic yard = _____
(A/E fill in estimated quantity to be included in bid)

Part __ = _____ Dollars $

Part __ - Excavation of Rock Material at Trenches: Excavation of rock material, where authorized or directed, proper disposal off-site of excess material and backfill with compacted trench fill material per specifications. (price per cubic yard) (Final amount shall be adjusted upward or downward based on actual quantity authorized.)

Estimated quantity of 50 cubic yards @ $ _____ per cubic yard = _____
(A/E fill in estimated quantity to be included in bid)

Part __ = _____ Dollars $

902.4 Minimum Standards for Parking Spaces

The following minimum parking space dimensions are standards for use in the design of state parking decks, parking garages and parking lots. Parking configurations, aisles widths, etc., shall be designed to meet or exceed the minimum dimensions recommended by recognized standards for parking designs. Consideration shall be given to the duration of parking/turnover rate in the sizing of spaces and aisles and to the protection of columns and walls by the use of wheel stops, bollards or guard rails, if applicable.

Type vehicle	Minimum width	Minimum length	Minimum area

902.4.1 For Parking Decks and Garages Utilizing Self Parking

Standard Cars	8'-6" **	18'-0"	153 sf
Compact Cars *	8'-0"	15'-0"	120 sf
Handicapped Spaces***		- See UFAS	

902.4.2 For Parking Lots Utilizing Self Parking

Standard Cars	8'-6"min **	18'-0"	153 sf
Compact Cars *	8'-6"min **	15'-0"	120 sf
Handicapped Spaces***		- See UFAS	

* Compact car spaces may be incorporated/designated where restrictions by walls, columns, piers or other restraints impede the use of standard size spaces.

** 9'-0" width preferred

*** Locate H/C spaces to minimize H/C users exposure to crossing traffic

902.5 Policy for Parking Space Planning

The following Parking Space Planning Policy applies to all new buildings, additions, and conversions. Buildings which undergo major renovations should comply to the greatest extent possible.

All projects that renovate or alter accessible facilities must provide an adequate number of parking space for disabled people. Adequate number of parking spaces means a minimum of 2 percent of the spaces required by this policy but no less than one space for each renovation or alteration project.

Spaces provided in the agency's Transition Plan would not necessarily have to be included in the renovation but would have to be constructed as scheduled in the plan.

VUSBC Use	Minimum Parking Spaces Required

A-1	One parking space for every four fixed seats.
A-2,A-3	One parking space for every 100 gross square feet or one parking space for every four occupants.
A-5	One parking space for every four fixed seats, special parking plans will be considered.
B	One parking space for every 250 gross square feet.
E	One parking space for every two employees, plus one parking space for every 10 students on an urban campus OR for every two students on a commuter campus.
F, H	One parking space for every two employees.
S, U	One parking space for every two employees.
I-2	One parking space for every two employees, plus one parking space for every 10 resident beds OR for every two patient beds (no additional spaces are required for Day Care occupancies).
I-3	One parking space for every two employees, plus one parking space for every 20 beds.
M	One parking space for every 200 gross square feet.
R-2	One parking space for every two employees, plus one parking space for every five beds.
R-3, R-4	One parking space for every individual housing unit.

NOTES:

1. Normally, the Commonwealth does not build use groups A-4 (churches), I-1 (group homes), or R-1 (hotels). If an agency proposes to build a project in one of these groups, it must submit a parking proposal to the Director of the Bureau of Capital Outlay Management for review and approval.

2. Parking spaces for the disabled shall be located closest to the nearest accessible entrance on an accessible route and no more than 250 feet from the accessible entrance.

3. For purposes of calculating employees/students, their number is equal to the number of workstations or the maximum number of employees/students in a shift.

4. If it is impossible to comply with the requirements, an agency must request a waiver from the Director of the Division of Engineering and Buildings. The request shall explain in detail why compliance is impossible and shall provide an alternative proposal for parking.

5. Parking plans may be developed for an entire campus, facility or complex which address the total parking spaces available for all buildings and their associated Use Groups. Where insufficient parking is provided on site, the Parking Plan shall address the availability of off site parking for the building / facility occupants.

903.0 CONCRETE

903.1 Special Requirements for Cast-In-Place Concrete

The specifications shall contain the following requirements in Section 03300 - Cast-in-Place Concrete:

1. ACI 301,ÒSpecification for Structural Concrete for Buildings (current edition) shall be incorporated by references as the standard unless otherwise modified.

2. Field tests of fresh concrete shall include Sampling - ASTM C172, Slump - ASTM C143, Making and Curing Test Specimens - ASTM C31, Air Content - ASTM 231 or ASTM C173, and Unit Weight - ASTM C138.

3. The Owner shall engage the services of the concrete testing laboratory to perform the sampling, cylinder preparation and delivery, testing and reporting. The Contractor shall be responsible for adequate advance notice to the testing laboratory for the contractor’s concrete pours/placement.

Individuals performing the field tests of fresh concrete shall have proper training, qualifications, and be certified as a Concrete Field Testing Technician-Grade I by the American Concrete Institute or other recognized certification conforming to the minimum requirements of the American Concrete Institute's certification which requires the successful completion of a written and performance examination on the applicable ASTM test methods of this section.

904.0 MASONRY

904.1 Special Requirements for Masonry

All brick and concrete masonry unit construction on state projects shall conform to the requirements of ACI 530 / ASCE 5/TMS 402 and of ACI 530.1 / ASCE 6/TMS 602 as referenced in the current VUSBC.

905.0 METALS

905.1 Steel Roof Deck

Corrosion protection is critical to maintain the structural integrity of the roof deck from moisture leaks through the roofing membrane. NRCA Bulletin 15-91 provides guidance on protection. Do not allow 'primer paint' coated deck on state projects. Require the steel roof deck to be Factory Galvanized , G-60 or G-90 (ASTM A924-94) or Factory coating with aluminum zinc alloy (ASTM A792).

906.0 WOOD & PLASTIC

906.1 Reserved

907.0 THERMAL & MOISTURE PROOFING

907.1 Waterproofing & Drainage for Subsurface Structures

No state buildings for human or equipment occupancy shall be designed with basement floor levels below the water table. Varying degrees of subsurface water content require the following minimal waterproofing and drainage techniques.

907.1.1 Soils with little or no obvious water content:

(1) Waterproof walls and provide any suitable waterproofing protection board.

(2) Provide perforated type drainage pipe with gravel surrounding.

(3) Backfill with suitable material that has some porosity.

907.1.2 Damp to wet soils with no obvious water source:

(1) Waterproof walls and provide protection board. Note: If geotechnical type drainboard is used, protection board may not be required.

(2) Provide perforated type drainage pipe and (if necessary) surround with full height gravel to the underside of the impervious soil or material. An approved geotechnical type drainage board may be used in lieu of the full height gravel at the contractors option.

(3) Provide impervious soil or material at finish grade.

907.1.3 Walls or floors below the groundwater table:

(1) Delete the lowest floor or space below the highest calculated groundwater table possible, or

(2) Raise the level of the lowest top of floor structure above the top of the highest calculated groundwater table possible, and follow the waterproofing techniques listed in 707A.2(b).

907.1.4 The use of a geotechnical filter fabric is recommended for protection board and perforated drainage pipe.

907.2 Roofing Policy

907.2.1 General: The Appropriations Act requires all agencies to give first priority to the roofs of its facilities. The provisions of Sections 707B.1 through 707B.15 shall govern the design of all low-slope, flexible-membrane (built-up and single-ply) roofs. Section 707B.16 shall govern the design of metal roofing systems.

New or reroofing project working drawings and specifications shall be prepared by an architect or engineer appropriately registered by the Department of Commerce, Commonwealth of Virginia. Procurement of these professional services is addressed in Chapter 4 of this Manual.

Assuming roofs are equal in other respects, low-slope roofs that shed water are more desirable than flat roofs that do not; and steep roofs are more desirable than low-slope roofs. Economy, aesthetics, constructability and compatibility are valid considerations in evaluation and design of roof systems. This section provides not only mandatory provisions but sound advice on improving the survival rate of low-slope roofs.

907.2.2 Roofing Abbreviations

BUR: Built-up Roofing

CSPE: Chlorosulfonated Polyethylene

EPDM: Ethylene Propylene Diene Monomer

FM: Factory Mutual

NDE: Non-Destructive Evaluation

NRCA: National Roofing Contractors Association

NRCA Manual: The NRCA Roofing and Waterproofing Manual (latest edition)

RCI: Roof Consultants Institute

RIEI: Roofing Industry Educational Institute

SPM: Single-ply Membrane

SPRI: Single-ply Roofing Institute

UL: Underwriters Laboratories

907.2.3 Acceptable Roofing Membrane: The following types of membrane are acceptable on low-slope roofs for state-owned facilities:

1. EPDM, Single-ply, 45 mil minimum thickness; 60 mil preferred.

2. Reinforced CSPE, Single-ply, 45 mil minimum thickness.

3. Built-up Roofing, Hot Bitumen, 4-ply minimum.

4. Hybrid 4 ply system with reinforced Modified Bitumen cap sheet. See Section 707B.13.

907.2.3.1 Other Roofing Membrane The Director of the DEB will consider the use of membranes other than EPDM, CSPE, and BUR only if the Owner requests and the A/E supports, in writing, the use of the alternative system. The request must be received and approved before working drawings are submitted for review and shall provide the following:

1. The reasons for using other membrane(s).

2. A description of the system(s) and membrane(s).

3. A summary of evaluated design criteria listed in Section 707B.11.

4. The A/E shall confirm in writing:

    1. That the roofing membranes and systems have been investigated and in the A/E's opinion are suitable for use on the proposed project roof(s);

    2. That at least three installations have had at least five years of successful service in Virginia or contiguous states - provide project names and Owner, approximate roof sizes, locations, contact names and telephone numbers;

    3. That the A/E has personally investigated at least three installations of the proposed system(s) and is satisfied that they will have a service life of ten or more years under normal conditions.

Requests that do not provide the foregoing information will be returned to the Agency without action.

907.2.4 Reroofing

907.2.4.1 Before reroofing a facility or making major repairs, the Owner must procure a roof survey performed by an experienced and qualified inspection service. The roof survey shall use infrared or nuclear NDE moisture detection methods. For roofs repairs or replacement, an asbestos survey shall be performed and the findings reported in writing.

Exception: For roofs that are very small or that have reached an advanced stage of deterioration and where a roof survey does not appear cost effective, an Agency may, after determining the conditions by visual inspection, request a waiver of the roof condition survey. The request must be accompanied by a roof plan sketch with features noted, a written description of the problems cross referenced to the plan, an approximate area of the roof, and photographs showing the conditions which support the request. An asbestos assessment is required.

907.2.4.2 If complete reroofing is required, then the requirements for new construction guarantees shall be included; and

907.2.4.3 If complete reroofing is required and insulation in the roof covering assembly provides required thermal resistance for the building, then insulation shall be provided in the roof covering assembly in accord with the requirements for new construction.

907.2.4.4 Provide secondary (emergency) roof drains in accord with the requirements for new construction.

907.2.5 Owner's Roofing Inspection: The Owner shall have a full-time inspector on the job while the roof is being applied. The inspector can be the project inspector or someone qualified to inspect a roof installation but, preferably, a RIEI Certified Quality Assurance Observer, RCI Registered Roof Observer or one who has attended Roof Consultants Institute Seminars. Before selecting an inspector, the Owner shall discuss the inspectors qualifications with BCOM and the A/E.

The Roofing Inspector shall check all materials and application procedures and prepare a daily written report covering such items as: the weather conditions, the deck conditions, the materials stored, the materials installed, and the installation procedures used including bitumen temperature at kettle and point of applications, etc. A copy of the daily report shall be given to the Contractor. The inspector shall not permit installation of roofing materials without having first obtained from the Design Architect a copy of the manufacturers certification confirming that the materials
delivered for use on the project meet the specified ASTM Standards or other approved Standards. The Owner shall inspect the roof(s) semi-annually, as a condition of the roofing guarantee and states maintenance policy. The Owner shall also inspect the roof(s) before the two-year guarantee expires. (See roof inspection form in Appendix G.)

Appendix (G) provides criteria and qualifications for selecting (1) full time roof inspectors and (2) roof consultants. It, also, provides (3) criteria for non-destructive evaluation (NDE) roofing surveys and (4) criteria for drawings to accompany NDE surveys. Forms used with (1), (2), and (3) are included in Appendix G.

907.2.6 Roofing Conferences: A prebid conference is not required but is strongly recommended for reroofing or roofing repair projects. A pre-roofing conference is required and shall be specified.

907.2.6.1 Prebid Conference: If specified, bidders shall not be required to attend. They may question or comment on the specified roofing system, materials, details, and any other details thought to affect the roof. Response to comments shall be in writing or by addendum if bid documents need changing.

907.2.6.2 Pre-roofing Conference:

(1) A conference shall be required and held before ordering roofing materials.

(2) Representatives of the Owner (including the Roofing Inspector), Architect, General Contractor, Roofing Contractor, Deck Contractor, Mechanical Contractor, and Roofing Manufacturer will attend.

(3) Review plans, specifications, flashing details, work scheduling, and workmanship standards required. Resolve problems and discrepancies.

(4) Prepare a written record of proceedings and make it a part of the job record.

907.2.7 Guarantees: Specify guarantees and warranties for new construction or reroofing in the Special Conditions or General Requirements (Division 1) as follows:

907.2.7.1 For New Construction

(1) The (General) Contractor shall submit a written guarantee in which he agrees to maintain the entire roof system(s) in a completely watertight condition at no cost to the Owner for two (2) years from date of final acceptance; except the watertightness guarantee shall not be enforced when the Contractor can prove water damage was caused by the Owner.

The guarantee shall cover the roofing membrane and flashing, metal flashing, parapet coping, and all properly detailed penetrations of the roofing membrane for such things as stacks, curbs, expansion joints, etc., which exist when the work is performed.

(2) Provide the following Roofing contractors guarantee on the General contractors guarantee form:

> "The roofing contractor shall guarantee its materials and workmanship associated with the roofing, flashings, and sheet metal work incidental to the work required under the roofing subcontract, against defect due to faulty materials or workmanship for a period of two (2) years from the date of completion of such work. It is understood and agreed by all parties hereto that the responsibility of the roofing contractor under this guarantee form or any contract document shall be limited to the limited guarantee herein expressed by said roofing contractor."

(3) Provide the following Owners Agreement on the Contractors guarantee form:

"The undersigned named Owner for the Commonwealth agrees, from the date of acceptance of the project, to maintain the roof in accordance with the manufacturers written requirements and agrees to avoid damage to the roof surface by any parties under his control working or walking on the roof. The Owner recognizes his responsibility to inspect the roof semi-annually."

(4) Authorized agents of the General Contractor, Roofing Contractor, and Owner shall execute the guarantee form.

(5) The General Contractor shall furnish, as a minimum, a manufacturers standard 10-year warranty/ guarantee.

907.2.7.2 For Reroofing

(1) The Contractor shall guarantee the materials and workmanship associated with the roofing, flashings, and sheet metal work incidental to the reroofing project against defects due to faulty materials or workmanship for a period of two (2) years from the date of completion
(2) Also, include wording in paragraph 707B7.1(3) on the contractors guarantee form.

(3) Authorized agents of the Contractor and Owner shall execute the guarantee form.

(4) The Contractor shall furnish, as a minimum, a manufacturers standard ten-year warranty/guaranty.

907.2.8 NRCA Roofing and Waterproofing Manual: Use the latest edition of the NRCA Manual as a guide in preparing plans and specifications for all new roofing projects and for reroofing projects to the extent practicable unless:

1. The NCRA Manual conflicts with provisions of this section, or

2. The A/E documents need for and obtains BCOM approval to use different details and provisions.

907.2.9 Bidding Roofing Systems: Specifications shall include bids for only one type of roofing system Ñ either built-up roofing or loose laid single-ply roofing, for example, but not both unless the Owner obtains approval to bid more than one system from the Director of BCOM. If more than one is approved, the systems shall be specified as options permitting the bidder to select the system he wishes to use. **The systems shall not be bid as alternates.**

907.2.10 Materials Certification

907.2.10.1 Specify that at the pre-roofing conference, the Contractor shall give to the A/E the roofing manufacturers certification that the roofing materials being furnished comply with specified ASTM and approved standards.

907.2.10.2 Specify that such certification shall be received with roofing materials delivered to the job site.

907.2.10.3 Specify that the A/E must receive a copy of the certification and give it to the owners full-time roof inspector before roofing materials may be installed.

907.2.10.4 The A/E shall give a copy of the certification to the BCOM representative at the final inspection.

907.2.11 System Evaluation: The A/E responsible for roofing design shall evaluate and specify the roofing system(s) for:

- Fire Resistance Rating
- Wind Uplift Resistance
- Warranty
- Tear Resistance
- Attachment
- Resistance to harmful local chemicals
- Membrane compatibility with insulation
- Type of membrane seams and joints

907.2.12 Single-ply Membrane (SPM) Specifications

907.2.12.1 Specify SPM completely with latest listed ASTM and performance criteria.

907.2.12.2 SPM, if specified with either manufacturer or brand-name products, shall be specified with three manufacturers and three equivalent products.

907.2.12.3 Use the latest edition of Roofing Materials Guide, published by National Roofing Contractors Association, to determine equivalent SPM.

907.2.12.4 The single-ply membrane manufacturers representative shall check installation procedures at start-up and inspect the completed membrane installation before ballast is applied.

907.2.13 Built-up Roofing (BUR) Membrane Specifications

907.2.13.1 Specify BUR and each BUR system component with latest available ASTM standards.

907.2.13.2 Specify, minimally, a built-up four-ply hot bitumen system.

907.2.13.3 Hybrid four ply systems shall have a reinforced Modified Bitumen cap sheet at least 120 millimeters thick with a mineral granule surface applied with hot asphalt over a three ply (minimum) hot

bitumen system. Since Modified Bitumen systems vary significantly, the A/E shall contact BCOM to verify that other requirements proposed to be specified are satisfactory.

907.2.13.4 If manufacturers are specified, specify three manufacturers and three systems.

907.2.13.5 Specify Equiment-Viscous temperature (EVT) for bitumen application.

907.2.14 General Requirements: The following requirements are generally applicable to all low-slope roofs. They shall be specified as indicated unless waived by the BCOM for justifiable reasons:

907.2.14.1 Roof Slope

(1) Specify that all roofs shall slope 1/4" per foot, minimum, to drains on all new roofs.

(2) If a 1/4" slope is impractical on replacement roofs, the Owner may request authority to use a lesser slope from the Director of the DEB.

* Dead level valleys are unacceptable. Valleys shall slope a minimum of 1/8" per foot unless impractical. In such case a waiver may be requested by the Agency to allow a slope of 1/16" per foot.

907.2.14.2 Wind Uplift: Rating of complete roof assemblies shall be Class 1-60 (1-90 for open coastline locations) designed in accord with FM P7825; alternatively, loose laid, ballasted applications shall be designed to withstand wind uplift in accord with requirements in SPR1 RP-4 (or FM Technical Advisory Bulletin 1-29).

If the above design methods are not used, roof covering assemblies shall be designed to withstanding an uplift pressure as determined by criteria in:

(1) Factory Mutual (FM) Loss Prevention Data Sheets 1-7 and 1-28S or

(2) Single-ply Roofing Institutes (SPRI) SPRI RP-4 Wind Design Guide

907.2.14.3 Insulation: Unless otherwise required to comply with a Manufacturers roofing system, specify insulation as follows:

(1) C or R (per inch) factor

(2) 2 layers, if thickness permits

(3) Staggered joints

(4) Mechanically fasten the first layer to the deck (unless the A/E can justify in writing to the BCOM why the insulation cannot or should not be mechanically fastened); adhere the second layer to the first with hot asphalt.

(5) Compatible Insulation: The A/E shall assure the Owner that the specified type of insulation has been investigated and is entirely compatible with contiguous, specified roofing materials.

907.2.14.4 Rooftop Equipment

(1) Avoid if possible.

(2) Comply with NRCA Manual recommendations.

(3) Design clearances and details for easy re-roofing.

(4) Provide prefabricated walks to and around equipment that requires servicing; walks must not block roof drainage.

907.2.14.5 Approved Applicator: Specify that the roofing and base flashing applicator shall be approved by the materials manufacturer.

907.2.14.6 Roof Protection: All specifications must state that before moving equipment or materials over a roof, the Owner, General Contractor, Roofing Contractor, and any of their agents must protect the roof from damage during and following roofing work. Movement of equipment and materials without roof protection shall be cause for the Owner, General Contractor, Roofing Contractor or A/E to stop work until protection is provided and any damage is corrected. The Owner's roofing inspector shall record all such violations

907.2.14.7 Pre-Final Inspection Survey: Unless the Owner, on advice of his A/E, requests a waiver of the survey for justifiable reasons given in writing and the Director of the BCOM approves the waiver, specifications shall include the following survey provisions:

(1) The A/E shall notify the Owner, Contractor, and Roofing Contractor (in writing) that he has inspected the roof(s) and finds it (them) sufficiently complete to permit a roofing survey. In no case shall the survey be made earlier than forty days before the Substantial Completion Inspection.

(2) The Owner shall engage the services of an experienced, independent roof survey inspection service or laboratory, to survey the roof(s). The service shall use infrared or nuclear moisture detection methods, except if the method used requires roof probes or cuts, it shall not void the Contractors two year guarantee and the Manufacturers standard warranty/guarantee.

(3) The Roofing Contractor shall cooperate and assist the inspection service by making and repairing any required cores, test cuts, or probes in such a way that Manufacturer's and Contractor's warranty/guarantees are not voided.

(4) A copy of the survey report shall be delivered to the BCOM no later than ten days before the Substantial Completion Inspection. Also, copies of all survey reports shall be delivered to the Owner, A/E, Contractor, and Roofing Contractor.

(5) The Owner shall pay for the service except that if the survey shows roofing deficiencies caused by improper materials, poor workmanship, or Contractor negligence, the Contractor, at his expense, shall repair or replace the roof(s) and provide additional surveys until the roofing work complies with the contract documents. All corrective work shall be completed before the final inspection.

(6) Acceptance of the roofing system shall be contingent on a roofing survey report that indicates the presence of no detrimental amount of moisture; for example, moisture that would cause a significant lowering of the thermal resistance of the roof; separation of the roofing plies; blisters; etc.

(7) Insulation that has lost more than 20% of its dry thermal resistance (R-value) and any materials covering the insulation shall be replaced by the Contractor at no cost to the Owner.

907.2.15 Final Inspection

907.2.15.1 The following items must be given to the Owner's representative at the Final Inspection:

(1) A copy of the (general) contractors and roofing contractors two-year guarantee.

(2) A copy of the roofing manufacturers standard warranty/guarantee.

(3) A copy of the manufacturers certification that roofing materials comply with specified ASTM standards.

(4) Copies of the History of Roofing Installation, Sample Form A; Roof Information Worksheet - Built-Up Roofing, Sample Form B, or Roof Information Worksheet - Single Membrane Roofing, Sample Form E. The A/E shall obtain forms from the Owner and complete all applicable items. (The Forms may be found in Appendix G.)

907.2.15.2 Representatives of the Owner (and the A/E), the Contractor, the Roofing Subcontractor, and the Membrane Manufacturer shall inspect the roof(s) between nine months and one year before the closing of the General Contractors one year guarantee. The Owner shall also have the roof inspected at least three months before the two year guarantee expires and notify the Contractor in writing of any defects noted. The Owner shall require that any defects be corrected at least 30 days prior to expiration of the guarantee.

907.3 Reserved

907.4 Metal Roofing Policy

907.4.1 General: These provisions shall govern the design of all metal roofs (low slope or steep slope).

New or reroofing project working drawings and specifications shall be prepared by an architect or engineer appropriately registered by the Department of Commerce, Commonwealth of Virginia.

907.4.2 Roofing Conferences: A prebid conference is not required but is strongly recommended for reroofing or roofing repair projects. A pre-roofing conference is required and shall be specified. See Section 922.6.1 and 922.6.2.

907.4.3 Guarantees: Specify guarantees and warranties for new construction or reroofing in the Special Conditions or General Requirements (Division 1) as follows:

For New Construction the (General) Contractor shall submit a written guarantee in which he agrees to maintain the entire roof system(s) in a completely watertight condition at no cost to the Owner for two (2) years from date of final acceptance against defects due to faulty materials or workmanship for a period of two (2) years from the date of completion. See Section ???707B.7.1(1).

For new and reroofing the Roofing Contractor shall guarantee the materials and workmanship for a period of 2 years. See Section ???922.7.1(2). Include the wording in Section ???922.7.1(2) on the Contractor's guarantee form.

Also, include wording in paragraph ???922.7.1(3) on the contractors guarantee form.

Authorized agents of the General Contractor (if new construction), Roofing Contractor, and Owner shall execute the guarantee form.

The General Contractor (for New Construction) and the Contractor (for reroofing) shall furnish on all pre-engineered buildings and other standing seam roofing systems on buildings for uses other than utility or storage a twenty (20) year non-prorated watertighness warranty provided from the roofing manufacturer. A twenty (20) year finish warranty covering fading, chalking and film integrity is recommended when an applied finish is specified.

907.4.4 A wind uplift performance rating equivalent to UL Class 90 (U.L. Test 580) is recommended on all buildings for uses other than utility or storage.

907.4.5 Traditional double lock seam or flat seam terne metal roofs which comply with SMACNA Architectural Sheet Metal Manual or the NCRA Metal Roofing Manual are acceptable.

907.4.6 Lapped rib panels with exposed fasteners are acceptable only for utility structures such as sheds, or where part of a pre-engineered building where manufacturer is responsible for watertightness.

907.4.7 Architectural systems (which must be installed over a solid deck) are allowable only for slopes 4:12 or greater, if they use clip-on caps or single lock ribs.

907.4.8 Structural systems (which can span between widely spaced purlins) may be used for low-slope roofs, and must have machine-locked ribs a minimum of 2" high, with tape or gaskets between ribs.

907.4.9 If panels are longer than 10', details and specifications must show where system is anchored (ridge, center, or eave) and how expansion is accommodated.

907.4.10 Gaskets or tape shall be used to make seams watertight. Use closures at ends of ribbed panels.

907.4.11 Systems other than those described above must be approved by BCOM for use at Preliminary review stage. Submit product data on the system used as the basis of design, and show that at least 2 other manufacturers make comparable systems. Provide a list of a minimum of three (3) installations that have had at least five years of successful service in Virginia. Provide names and owner, approximate roof size, location, contact names and telephone numbers.

907.4.12 Comply with additional recommendations of manufacturer and NRCA Handbook.

907.4.13 Approved Applicator: Specify that the roofing applicator shall be approved by the materials manufacturer.

907.4.14 Roof Protection: All specifications must state that before moving equipment or materials over a roof, the Owner, General Contractor, Roofing Contractor, and any of their agents must protect the roof from damage during and following roofing work. Movement of equipment and materials without roof protection shall be cause for the Owner, General Contractor, Roofing Contractor or A/E to stop work until protection is provided and any damage is corrected.

907.4.15 Final Inspection

907.4.15.1 The following items must be given to the Owner's representative at the Final Inspection:

(1) A copy of the (general) contractors and roofing contractors two-year guarantee.

(2) A copy of the roofing manufacturers warranty/guarantee. See Section 707B.16.3(5).

(3) A copy of the manufacturers certification that roofing materials comply with specified (ASTM) standards.

(4) Copies of the History of Roofing Installation, Sample Form A; and Roof Information Worksheet – Sheet Metal Roofing, Sample Form C. The A/E shall obtain forms from the Owner and complete all applicable items. (The Forms may be found in Appendix G.)

907.4.15.2 Representatives of the Owner (and the A/E), the Contractor, the Roofing Subcontractor, and the Roofing Manufacturer shall inspect the roof(s) between nine months and one year before the closing of the General Contractors one year guarantee. The Owner shall also have the roof inspected at least three months before the two year guarantee expires and notify the Contractor in writing of any defects noted. The Owner shall require that any defects be corrected at least 30 days prior to expiration of the guarantee.

908.0 DOORS & WINDOWS

908.1 Area of Glass in Exterior Walls: The use of glass (excluding frame members) in the exterior walls of buildings shall not exceed 17.5 percent of the exposed gross outside wall area as a base design. Where glass areas exceed 17.5 percent, the A/E shall describe in the preliminary submittal how it intends to make compensatory adjustments in the exterior envelop to meet the "Uo" requirements and energy requirements in the USBC as amended by the energy requirements in Section 915 that are required to meet the Governor's Energy Policy.

The A/E shall also provide calculations which show the cost of the exterior wall with glass not exceeding the 17.5 percent, cost of the exterior wall with the proposed glass areas, and the HVAC annual operating cost for heating and cooling for the <17.5% versus the proposed area of glass. After evaluating this data, the Agency may provide this data to BCOM with its request for exception to the 17.5% glass policy. Where the Agency has the appropriate delegated authority, send a copy of the letter signed by the Chief Facilities Officer, or other designee, stating that the Energy Policy has been met and that the proposed glass area is approved.

Each set of plans submitted for review must include the consultant's computations as to the percentages of glass versus exterior wall area.

908.2 Glazing: For a building designed with the capabilities for both heating and cooling, the use of double glazed glass is required and low-emissivity solar glass is strongly recommended. For buildings provided with heating only, double glazed glass shall be utilized. (A waiver from this requirement will be considered based on the merits of the case.)

908.3 Shading Window shading, interior and/or exterior, shall be completely described in the preliminary submittals. Window shading shall be taken into consideration when calculating cooling loads. Indicate who will provide window shading devices.

908.4 Operable Sash Windows shall have operable sash. If operable sash can be documented to be impractical, the Agency can request a waiver of this requirement from the BCOM Director.

909.0 FINISHES - Reserved

910.0 SPECIALTIES - Reserved

911.0 EQUIPMENT - Reserved

912.0 FURNISHINGS

912.1 Guidelines for Selecting Furniture and Accessories

912.1.1 Facilities should have functional interiors, reasonably pleasant in appearance and conductive to the purpose for which they were constructed. Lavish design, gold plated in any respect or even having the appearance of being wasteful of government funds, should be avoided. In furniture and furnishings, items that should not be used include oriental and decorator rugs, period furniture reproductions (Williamsburg, French Provincial, Early American, etc.) figurines or "objects d art", free standing decorator items such as large world globes, leather covered furniture, and original paintings or numbered prints, especially if signed by the artist, ornate chandeliers and elaborate window coverings.

912.1.2 Criteria for furniture selection shall include function, anthropometric considerations, maintenance, durability, comfort and cost. Careful consideration shall be given to coordination of building and furniture finishes and colors. Shelving, storage and other similar tall or high density equipment shall conform to fire regulations regarding overhead clearances, density, etc.

912.1.3 Furniture selections should be made to the greatest extent possible from items available on State contracts. Selection of substitutions for items on contract must be supported by detailed information and documentation. This justification must accompany any waivers submitted to the Division of Purchases and Supply requesting procurement for non-standard items.

912.1.4 Provide detailed working drawings and specifications for the procurement, fabrication and installation of custom furniture, etc., from commercial sources.

912.1.5 Technical equipment, linens (except draperies and bedspreads), housekeeping items and other equipment shall not be included in the interior design procurement package.

913.0 SPECIAL CONSTRUCTIONS - Reserved

914.0 VERTICAL TRANSPORTATION

914.1 Elevators

914.1.1 Final Acceptance: Include the following statement in all Elevator Specifications:

"As a part of final acceptance of the project and in accordance with the General Conditions, the Contractor shall have a Qualified Elevator Inspector (QEI) conduct a full Acceptance Inspection and Test in accordance with ASME/ANSI A17.1 before final acceptance by the Owner. The Contractor shall obtain from the elevator contractor and/or manufacturer and furnish to the Owner all data affecting the elevator installation or modification, including 'as-installed' circuit and control wiring diagrams and maintenance manuals."

914.1.2 Microprocessors: If microprocessor control systems are provided for elevators, include the following:

1 In the general portion of the elevator specification include the following:

Repair Requirements: "For elevator microprocessor control system, provide maintenance diagnostic tools, electrical schematic wiring diagrams, and any access codes and passwords required for all maintenance functions, including diagnostics, adjustments, and parameter reprogramming. Tools may be hand held or built into the control system and shall function for the life of the equipment. Tools provided shall be usable throughout the life of the equipment without the requirement to return to the manufacturer. Provide complete operations and maintenance manuals including diagnostics instructions for troubleshooting the microprocessor system."

2 In the products portion of the elevator specification include the following under the Control Equipment description:

Solid-State Control: "Elevator controller shall be solid-state microprocessor based for dispatch and motor control."

914.1.3 Elevator Cab Size: All new buildings provided with elevator service shall have at least one elevator sized and configured to accommodate an ambulance type stretcher (76 inch x 24 inch) in the horizontal position. See the applicable BOCA Building Code Section on elevators and conveying systems for additional requirements. Where existing elevators are being replaced, the above criteria shall be met where possible.

914.1.4 Application of ANSI/ASME A17.1, Rule 102.2(c)(4): In order to prevent people from being trapped in an elevator when power is automatically disconnected in accord with the requirements of ASME/ANSI A17.1, Rule 102.2 (c)(4), the policy below shall be applicable for all new and remodeled state building elevator systems

914.1.5 Before power is automatically disconnected in accord with ASME/ANSI A17.1, Rule 102.2 (c)(4), provide controls necessary to accomplish the following:

1. Heat detectors required by Rule 102.2 (c)(4) shall provide a signal to initiate Phase I Fireman's Service Emergency Recall Operation Rule 211.3a. The activation sequence shall be similar to requirements for smoke detectors in Rule 211.3b. No additional heat detectors are required other than those called for by Rule 102.2(c)(4).

2. Provide an elevator travel time delay, equivalent to the elapsed time for an elevator to travel from its farthest stop to the designated recall level plus ten (10) seconds before power to the elevator equipment is disconnected and pre-action sprinkler is activated as required by Rule 102.2(c)(4). [Elevator Travel Time Delay = The time for an elevator to close its doors, under Phase I conditions, return to the designated recall level, and open its doors. If there are multiple elevators, the elevator having the greatest travel time shall be used in determining the time delay.] See Sample Circuitry Diagram in Figure 714A-1.

915.0 MECHANICAL DESIGN STANDARDS

The criteria contained in this section supplements VUSBC to assure minimum standards as indicated and applies to all appropriate projects in the Capital Outlay Program. Its purpose is not to limit architectural and engineering freedom, but to create an awareness that all designs must effectively minimize the use of energy. The development of these standards/guidelines has demonstrated that energy efficient designs provide very significant energy savings and reductions in life cycle costs. Compliance with these standards/ guidelines is mandatory.

The criteria in this section applies to all new buildings, additions and applicable renovation projects. Refer to the Appendix for portions of the latest codes which were not adopted and are, therefore, deleted from Code requirements. Energy efficiency considerations are a function of building design. All projects financed by the state will be evaluated for energy conservation and life cycle costs.

Computerized energy budget analysis, forecasting energy consumption in BTU/GSF/year is mandatory for all projects with greater than 8,000 gross square feet which have heating and cooling and with greater than 20,000 gross square feet which have heating only.

915.1 Building Envelope Design Standards

915.1.1 Should the characteristics or circumstances of a particular project justify not meeting any of the requirements below, approval of the design must be requested and obtained from BCOM. Such request must be supported by the merits of the particular project in conjunction with a Life Cycle Cost Analysis to demonstrate that the life cycle costs will not be increased when compared to a design in full compliance. The design shall comply with the VUSBC and this Manual.

915.1.2 The proposed design shall consider energy conservation in determining the orientation of the building on its site; the geometric shape of the building; the building aspect ratio; the number of stories for a given floor area requirement; the thermal mass of the building; shading and reflections from adjacent surfaces or vegetation; opportunities for natural ventilation; and wind direction and speed. The use of cantilevered spaces is discouraged. If unusual circumstances allow this design to be approved in a

given instance, the U factor shall conform with the applicable Virginia Uniform Statewide Building Code and this Manual.

915.1.3 Thermal performance: Each building which is heated or mechanically cooled shall be constructed so as to provide the required thermal performance of the various components. The required thermal transmittance values (Uo) of any one component, such as roof/ceiling, wall or floor, may be increased and the Uo values or other components decreased when it is shown that the overall heat gain or loss for the entire building envelope does not exceed the total resulting from conformance to the required Uo values. A building that is designed to be both heated and cooled shall meet the more stringent of the heating or cooling requirements for the exterior envelope as provided for in this section when requirements differ.

915.1.4 For a building heated and cooled to the acceptable human comfort level, the following overall average Uo values shall be used as an assembly maximum:

Exterior Wall Assemblies*	Uo = 0.110
Roof-Ceiling Assemblies**	Uo = 0.065
Floor over unconditioned space	Uo = 0.074
Wall adjacent to unconditioned interior space	Uo = 1.170
Wall below grade	"R" = 8.000

Unheated slab on grade	Horizontal	Vertical
@ 24" width/depth	"R"= 13	"R"= 7
@ 36" width/depth	"R"= 11	"R"= 6
@ 48" width/depth	"R"= 9	"R"= 4

*For the purposes of this Manual, the gross area of exterior wall assemblies shall consist of all opaque wall areas (including foundation walls above grade), peripheral edges of floors, window areas (including sash) and door areas, where such surfaces are exposed to outdoor air and enclose a heated or mechanically cooled space.

**Skylights shall be considered only if the combined heat gain/heat loss to the building (including solar gains) does not exceed the values obtained using the maximum "Uo" value shown.

915.1.5 For a building heated only (above 50º F), the overall average Uo values of the assemblies may be increased to the maximum values listed below:

Exterior Wall Assemblies	Uo = 0.190
Roof-Ceiling Assemblies	Uo = 0.080

915.2 Heating, Ventilating, and Air Conditioning Design Criteria

915.2.1 General

(1) Schematic submittals (or preliminary submittals if schematics are waived): Each building shall acknowledge compliance with this criteria and also state what special efforts for energy conservation are planned for the HVAC system.

(2) Preliminary submittals shall include ventilation design criteria and sufficient data to show compliance with requirements.

(3) The use of recognized, proven and cost effective energy conservation methods and equipment is encouraged.

915.2.2 Design Conditions: Design heating and cooling systems using the following criteria:

(1) Heating - Use the median of annual extremes for outside temperature included in the Figure 915.3.1 or the ASHRAE Handbook 1993 Fundamentals data. Use Inside Design Condition Criteria in Figure 915.3.2 for inside temperatures.

(2) Cooling - Use 2-1/2% figures for outside Wet Bulb and 2-1/2% figures for Dry Bulb temperatures included in Figure 915.3.1 or the ASHRAE Handbook 1993 Fundamentals data. Use Inside Design Condition Criteria in Figure 915.3.2 for inside design temperature.

(3) For any Occupancy/Use not shown in the Inside Design Condition Criteria, Figure 915.3.2, consult ASHRAE Handbooks or other applicable references for suggested criteria and obtain BCOM approval of conditions proposed for use in design.

915.2.3 Methods of energy conservation, such as energy recovery from exhaust air shall be evaluated.

915.2.4 System shutdown and night setback shall be provided for all systems to reduce energy use during periods of non-use.

915.2.5 Ventilation rates and total air circulated shall be kept to the minimum as required by VUSBC, ASHRAE Standard 62-1989, or recognized special space requirements. Each mechanical ventilation system (supply and/or exhaust) shall be equipped with a readily accessible means for either shutoff or volume reduction when ventilation is not required, including morning warm-up.

915.2.6 Use outdoor air for cooling as defined by the VUSBC.

915.2.7 Humidification for human comfort will not normally be allowed.

915.2.8 The use of electric resistance as the primary source of heat is not allowed without approval. If electric resistance heat is the only option for heating, documentation justifying the same shall be submitted to BCOM for approval.

915.2.9 Energy sources for heating and cooling systems shall be determined from an analysis of the efficiency of use and economy of those available for each project. Where practical the use of coal as the primary source for heating shall be considered in all cases. Parameters for analysis are described in Appendix I. The analysis shall be submitted for review with the preliminary documents and shall be summarized on the Life Cycle Cost Worksheets provided in Appendix I. The data submitted shall include:

(1) A Life Cycle Cost Worksheet for each fuel studied.

(2) Estimated yearly consumption for each fuel.

(3) Unit costs and other backup data to support the summary.

(4) Building area.

(5) Building heating load.

(6) Domestic hot water load.

(7) Other heating requirements.

(8) Building cooling load.

(9) Engineers and Owners recommendations.

A calculation of the total building energy consumption, expressed as BTU input per gross building square foot per year (BTU/GSF/YR), shall be submitted for each building.

915.2.10 Energy efficiency standards for small and large commercial package air conditioning and heating equipment, packaged terminal air conditioners and heat pumps, warm-air furnaces, packaged boilers, storage water heaters, instantaneous water heaters, and unfired hot water storage tanks shall meet the requirements of the VUSBC.

915.3 Climatic Conditions and Temperatures for Design

The interior and exterior conditions for use in the design of heating and cooling systems for state owned buildings are included in Figure 915.3.1, Climatic Conditions for Design and in Figure 915.3.2, Inside Design Condition Criteria.

	Winter °F	Summer °F	
Station	Median of Annual Extremes	Design Dry Bulb 2-1/2%	Design Wet-Bulb 2-1/2%
Alexandria/Reagan Nat'l AP	7	91	77
*Big Stone Gap	3	91	74
*Blacksburg	0	91	74
*Bluefield	8	81	71
*Bristol	4	89	75
Charlottesville	8	91	76
Danville AP	9	92	76
*Fairfax/Dulles IAP	7	91	77
Fredericksburg	6	93	77
Harrisonburg	0	91	74
Lynchburg AP	8	90	76
*Manassas	10	93	77
Norfolk AP	15	91	78
Petersburg	10	92	78
Richmond AP	10	92	78
Roanoke AP	8	91	74
Staunton	3	91	74
*Williamsburg	14	92	78
Winchester	4	90	76

Notes: For stations not listed above, coordinate design climatic conditions with the Division of Engineering and Buildings (DEB). Conditions shown shall be used for projects in these localities.

* These locations do not appear in ASHRAE.

Climatic Conditions for Design

Figure 915.3.1

OCCUPANCY/USE	SUMMER (COOLING)	WINTER (HEATING)
Offices/Business	78°Fdb	70°Fdb
Classrooms/Lecture	78°Fdb	70°Fdb
Residential	78°Fdb	70°Fdb
Libraries*	78°Fdb	70°Fdb
Archival Storage in Libraries	Special	Special
Art Storage in Museums	Special	Special
Kitchens***	85°Fdb or Spot Cooling	70°Fdb
Warehouses, Mechanical Rooms, Storage Rooms,& Electrical Rooms	Ventilate with outside air unless otherwise approved	40-55°Fdb For Freeze Protection
Pools**	82°Fdb 50-60% RH Pool Water: 80°F	82°Fdb 50-60% RH Pool Water: 80°F
Hospitals	Consult the ASHRAE Guide or other applicable references	
Laboratories* (Educational)	78°Fdb 30-60% RH	70°Fdb 30-60% RH
Gymnasiums/Recreation, Indoor Tennis & Racquetball Courts, Weight Rooms, & Aerobics Rooms***	80°Fdb	68°Fdb
Locker Rooms/Showers***	80°Fdb	70°Fdb
Prisons/Detention	82°Fdb	68°Fdb

* Conditions may vary depending upon actual user justified requirements. Deviations must be approved by the Bureau of Capital Outlay Management.

** Cooling for this type occupancy/use must be justified to and approved by the Director, Division of Engineering & Buildings (DEB).

*** These Occupancy/Use types are not normally provided with cooling unless justified to and approved by DEB . Where approved, design conditions shall not exceed those indicated.

Inside Design Condition Criteria

Figure 915.3.2

915.4 Building Energy Requirements

The preliminary submittal shall include calculations along with the Basis of Design per Appendix C to assure that the design complies with the VUSBC requirements and the Energy Conservation standards of this Manual including the thermal transmittance values shall be as outlined in Section 932.

915.5 Steam and Hot Water Distribution Systems

The basic requirements for these systems are as follows:

915.5.1 The distribution system will be planned, laid out and constructed with consideration given to future extensions, taking into account line routing, sizing, and valving (for main line and branch isolation).

915.5.2 Underground piping systems distributing steam, condensate, low and high temperature water and other heating media above 150ºF shall be installed in box trenches or tunnels. A direct burial system shall not be permitted without approval. Construction shall be designed to prevent the intrusion of water and other substances into box trenches or tunnels for a minimum of 25 years.

915.5.3 Pipe shall be properly supported, anchored, and guided to allow for expansion/contraction. Expansion loops, slip joints, and/or ball joints may be applied (to be packed and lubricated under full line pressure). Bellows type joints are not acceptable. Systems must be ventable and drainable.

915.5.4 The drawings for the distribution system shall include both a plan view and a profile view of the system indicating points of connection, anchorage points, loops, points of support, elevations (on profile view), junctions and crossovers/crossunders with other utilities or obstructions and other pertinent data required for construction. Drawings shall also include typical and special details of supports, anchors, connections and other similar conditions.

915.5.5 Materials of construction and fabrication must lie within allowable stress values specified by the ASME Code. Design life will be 30 years.

915.5.6 Pipe systems at elevated temperatures (greater than 150ºF.) will be designed to stay dry, be corrosion protected, and to have economic heat loss rates.

915.5.7 Above-ground steam and hot water distribution systems should be used where they are feasible.

915.5.8 Insulation materials must have high compressive strength, low permeability, low conductivity; must be non-corrosive, and vermin-proof. Insulation must be dryable if wetted, and withstand repeated or extended boiling without damage or loss of insulating qualities. Pre-molded types are to be used; loose fill and blanket types are unacceptable.

915.5.9 The piping shall be hydrostatically tested before insulating and before field joints are backfilled.

915.6 Domestic Hot Water Systems

915.6.1 In facilities with large hot water needs such as in prisons, dormitories, kitchens etc., water heating should be supplied by hot gas reclaim where practicable.

915.6.2 Evaluations should be made to prevent the operation of central space heating boiler plants, in summer months, solely for the purpose of supplying domestic hot water needs. A separate domestic hot water system should be used in this case.

915.6.3 Reduce per person requirements to the absolute minimum.

915.6.4 Use chemical sterilization and/or booster heater systems for dishwashing needs instead of higher temperature supply hot water.

915.6.5 Maximum water use rates for shower heads, faucets, water closets and urinals shall meet the requirements of the VUSBC.

915.6.6 Residential type water heaters for 1 and 2 family dwellings or apartment style units where a central domestic hot water system is not used or required shall meet the requirements of the VUSBC

915.7 Recording Energy Usage

Executive Order #54 requires agencies to reduce energy consumption and requires the Department of Mines, Minerals and Energy (DMME) to provide a consolidated report of such. Each facility with a Building Automation System (BAS) shall provide an Internet Protocol (IP) address to the BAS vendor for the transmission of energy data. The BAS will collect the facility energy consumption data required by DMME and transfer this data over the internet to the Statewide Energy Database DMME has selected Tridium Vykon Energy Suite as the software hosting the Statewide Energy Database. Contact DMME for details on the database and reporting.

The Agency shall collect and provide electronically energy consumption data to the Department of Mines, Minerals and Energy (DMME) Statewide Energy Database. The Agency shall provide facility energy consumption data to the Tridium Vykon Energy Suite over the Internet through the IP address provided. Contact DMME to coordinate details.

915.8 Building Automation Systems & Procurement Procedures

915.8.1. General: Current Building Automation Systems (BAS) and Energy Monitoring and Control Systems (EMCS) have proprietary protocol and programs which limit their ability to tie-in or interface with the systems of other manufacturers or vendors. Although ASHRAE has recently developed a

standard protocol for BAS/EMCS to facilitate interfaces between vendors, very little equipment is currently available that totally supports this protocol.
Therefore, it is essential that agencies give careful consideration and attention to the planning, procurement, pricing, and implementation of their BAS and EMCS requirements and expansions.

915.8.2. Planning: The planning for a BAS or EMCS shall include consideration and evaluation of the following:

- Will the BAS/EMCS serve a single or multiple buildings?
- What functions, control and data gathering activities will the BAS/EMCS provide?
- Will the BAS/EMCS be tied-in to a Central Station?
- Will the Central Station provide only monitoring and data gathering functions?
- Will the Central Station Operator be able to control the BAS/EMCS functions at the separate or remote building?
- Does the Agency have a BAS/EMCS currently installed at this location, campus, etc.?
- How many vendors have a BAS or EMCS at this location?
- Which vendors actively serve systems in this general area?
- Has the Agency obtained cost data for comparison for installation costs and for service/maintenance costs on similar systems? (This is necessary if the Agency intends to procure the BAS/EMCS as a sole source or competitively procured system.)

915.8.3. Policy on BAS/EMCS Competition: The Virginia Public Procurement Act (VPPA), § 2.2-4300 through 2.2-4377, *Code of Virginia* as amended, contains the statutory procurement methods, requirements and restrictions. Simply put, the VPPA requires that the BAS/EMCS be competitively procured unless specific approval has be obtain to use a sole source procurement. Unless otherwise approved, Building Automation Systems (BAS) or Energy Management Control Systems (EMCS) shall be specified using performance or non-proprietary specifications. This should result in maximum competition and best cost for the state.

Where an Agency has, or will have, multiple buildings with a BAS/EMCS and where the Agency has, or intends to have, a central monitoring or central control station for the multiple building systems, consideration should be given to having the systems/ central stations of 2 vendors so that the vendors can compete with each other for future systems and/or tie-ins.

915.8.4 Building Automation System Evaluation: To expedite the review of the BAS/EMCS system for a project, the A/E, with input from the Agency, shall provide the information required by the Building Automation Systems Questionnaire (Figure 715-E-1) to describe the currently existing BAS's and shall submit to BCOM not later than with the preliminary drawing submittal. The information provided by this questionnaire is essential in considering the Agency request for approval of proprietary or sole source procurements and in the BCOM review of the proposed system at working drawings design stage.

915.8.5 BAS/EMCS Procurement: One of the following methods shall be used to procure the BAS/ EMCS for the project:

1. Non-proprietary / General Contract Bidding - All vendors may bid on the work. No special approvals are required. A Non-proprietary BAS/EMCS performance specification is included in the bid documents for competitive bidding along with all other work.

2. Proprietary / General Contract Bidding - Where two vendors each have a BAS/EMCS currently in operation at the site and/or where the Agency has made a determination in writing that only 2 or 3 vendors will be acceptable and all others are excluded, the Agency may obtain approval from the Director, Division of Engineering and Buildings, to proprietarily specify that the BAS/EMCS bidders be restricted to those vendors listed in the specifications. The successful subcontract bidder would be required to perform the work required by the documents just as any other subcontractor.

3. Sole Source Separate Procurement - Prior to completing the Working Drawings , the Agency must make a determination in writing that only one vendor can meet the Agency's requirements for the BAS/EMCS and obtain approval for a Sole Source procurement of the BAS/EMCS work. Once the use of sole source procurement is approved, the Agency must decide if the Agency will supervise and manage the vendor or if the Agency will assign the BAS/EMCS vendor's contract to the project (General) Contractor to supervise and manage.

The Agency shall then negotiate a price with the sole source vendor for the specified BAS/EMCS work and/or tie-in on the basis of the specifications and the contract management procedures selected and commit the agreement to writing.

If the (General) Contractor will be tasked with coordinating and supervising the BAS/EMCS vendor/subcontractor, the price and the name of the vendor for this automation work shall be placed on the Bid Form using the wording shown on the Sample Bid Form Format in Appendix C. The (General) Contractor Bidder is required to include this subcontract price plus any markups for supervision, coordination and profit in its bid and to be responsible for this work just as if the bidder had selected this subcontractor itself.

When using this method 3, any part of the HVAC control system, fire alarm system, valves, dampers, etc., which do not have to be Sole Source shall be competitively bid.

If the Agency/Owner elects Method 3, measures must be taken to ensure the cost and configuration of the system are reasonable such as using cost data for installation and for service/maintenance on similar systems for comparison.

915.8.6. Design and Specification of BAS/EMCS:

915.8.6.1 The Schematic Submittal shall indicate if a BAS/EMCS will be required for the project. If required, the submittal indicate which method the Agency intends to use to procure the system.

915.8.6.2 The Preliminary Submittal shall include a copy of the Sole Source procurement request approval from the Chief of Staff or the Proprietary procurement request approval from the Director, Division of Engineering and Buildings if method 2 or 3 are proposed for use.

915.8.6.3 If Method 1 or 2 above are selected for use, the A/E shall include the following BAS/EMCS information in the documents at the working drawing submittal:

- Performance specifications
- Sequence of operation
- Input / Output Summaries
- Control schematics
- Equipment (front-end computer, etc.) locations
- Control legend

915.8.6.4 If Method 3 above is selected for use, the Engineer shall require the BAS/EMCS vendor to provide the following to BCOM at the working drawing stage (and prior to the Owner's final agreement to the scope of work and the price):

- A breakdown of the vendor's proposed cost including materials, markups, subcontractors, labor, and training.
- A completed input/output summary similar to the one located in Figure 715-E-2, including a cost per point broken out into major types. (i.e., A.I., A.O., D.I, D.O., etc.)
- Control schematics and sequence of operation including interface with any other control system, and software functions that will be incorporated into the system.
- Details of any major additions to the system front-end/operator interface hardware and software.

915.9 Piping & Equipment Color Code Schedules

Piping and equipment in central (power) plants and elsewhere as required by the Owner/Agency in mechanical equipment rooms shall be completely painted according to the Scheme For The Identification Of Piping Systems, ANSI A13.1-1981 and the Safety Color Code For Marking Physical Hazards, ANSI Z53.1, latest revisions. The Owner/Agency may require other appropriate identification devices in lieu of complete painting of piping and equipment in mechanical equipment rooms. In addition, all piping in the building shall be identified at 30' intervals and on either side of penetrations through walls and floors to show the contents of the pipe and the direction of flow. Include the painting requirements in the specifications to suit project.

915.10 Pressure Vessels

915.10.1 All fired or unfired pressure vessels whether a part of an equipment package or an entire piece of equipment shall be specified to comply with the ASME Code. The specifications shall require that the pressure vessel be so stamped in an easily identifiable location and that the manufacturer's data indicating ASME compliance be submitted.

915.10.2 Comply with the Boiler and Pressure Vessel Rules and Regulations issued by the Virginia Department of Labor and Industry.

915.11 Chemical Cleaning & Chemical Water Treatment of Boilers & HVAC Systems

915.11.1 The boilers, the HVAC systems, all system piping, and all system related equipment shall be thoroughly flushed out with pre-cleaning chemicals designed to remove construction related deposits such as pipe dope, oils, loose mill scale, and other extraneous material. Systems shall be cleaned and/or boiled-out in accordance with the manufacturers instructions and the recommendations of the Owners Water Treatment Consultant. The products used shall inhibit corrosion of the various metals in the system and shall be safe to handle and use.

915.11.2 The A/E shall consult with the Owner and his Water Treatment Consultant to determine the proper cleaning and water treatment requirements for boilers, piping, and other HVAC systems. If the Owner does not have a Water Treatment Consultant, the Owner shall utilize the Division of Purchases and Supply contract for water treatment.

915.11.3 The A/E shall specify the standards and requirements applicable to the chemical cleaning and water treatment of the system. The following should be addressed:

- The standards to be met by the Contractor in flushing, cleaning and treating the system;
- That the Contractor is responsible for providing all equipment, fittings, tubes, valves, connections, labor, chemicals, and miscellaneous hardware for the boiler boil-out, for the flushing, cleaning and associated water treatment, and for the initial chemical water treatment for the boilers and HVAC systems; and
- The chemicals to be used for the initial treatment of the system after flushing and cleaning have been completed;
- That the chemical formulation used shall be compatible with system materials;
- That the chemicals used shall conform to DEQ regulations and requirements; and
- That the chemical mixtures do not exceed DEQ or local effluent limits.

915.11.4 The A/E must specify that the Contractor notify the Owner (approximately) 30 days before the boil-out/cleaning of the system and the application of the chemicals are started. The Owners Water Treatment Consultant shall observe and monitor the boil-out/cleaning of the system and the initial charge of chemicals required for placing the equipment in normal service.

915.11.5 The contract documents shall require that after cleaning and chemically treating boilers and HVAC systems, the Contractor shall furnish the Owner, in writing, the following information:

(1) Date of initial treatment.

(2) Type of chemical(s) used for treatment.

(3) Estimated date that further treatment or testing will be required.

915.11.6 The Owner and his Water Treatment Consultant shall continue monitoring and treating the water after initial treatment.

915.12 Chlorofluorocarbon (CFC) Refrigerants

915.12.1 Federal law, Title VI of the Clean Air Act Amendments of 1990, places restrictions on the production (with eventual phase-out) of CFC refrigerants. The Architect/Engineer shall give due consideration to current Federal law and future implications of such in the design of state projects.

915.12.2 The use of CFC or other refrigerants shall be carefully considered. The A/E shall endeavor to protect the interests of the Commonwealth of Virginia recognizing the following:

(1) Responsibility to protect the environment.

(2) Dependability and serviceability of the proposed systems.

(3) Economic considerations both short and long term.

915.12.3 Where refrigerants are used, the mechanical equipment room design shall comply with the requirements of ANSI/ASHRAE Standard 15-1994.

915.13 Central Heating Plants - Reserved

915.14 Central Chiller Plants - Reserved.

916.0 ELECTRICAL

916.1 Temporary Electrical Service:

916.1.1 In construction projects where it is specified that the Owner/Agency will pay for the consumption of electricity required for construction, and electricity is not available directly from the Owner/ Agency, the following statements shall be added to the Specifications (usually the Special Conditions).

"The Contractor shall obtain a separate metered electrical service in the name of the Owner/Agency for use by the Contractor for construction purposes."

"Costs required to provide electrical service to one point on the construction site will be borne by the Owner/Agency. Distribution from that point shall be the responsibility of the Contractor."

916.2 Ground-Fault Circuit-Interrupter (GFCI) Protection

GFCI Protection is required in the following instances:

1 Where required by the latest version of the National Electrical Code in effect.

2 Where 125 volt, single phase, 15 and 20 amp receptacles are installed in exterior areas, in interior areas within six (6) feet of a sink or lavatory and in other areas where it is necessary to increase the level of safety.

916.3 Lighting Levels

Artificial lighting shall provide the recommended levels of illumination as given in Chapter 11 of the Illuminating Engineering Society of North America (IESNA) Lighting Handbook, 8th edition. Office area general lighting shall be designed for a minimum of 30 footcandles with 1/2 the luminaires switched on and 50 footcandles with all luminaires switched on provided adequate outlets are available for task lighting to achieve 75 footcandles at work stations. Minimize reflected glare in offices or office areas where computers are used by implementing such methods as low-brightness luminaires, indirect lighting, minimizing luminance ratios between different surfaces and such.

Provide multiple points of control by split switching of fixtures, occupancy sensors, daylight control, and such as required by ASHRAE 90.1-1989. Circuit large areas to allow general lighting to be reduced when the full lighting level is not necessary, such as during custodial/cleaning services.

Use energy efficient luminaires, lamps, and ballasts for general lighting. Limit the use of incandescent lamps to spotlighting and accent lighting and utility lighting in small areas.

916.4 Energy Efficient Lamps

Specifications for new construction and for light fixtures and electric motors being replaced in existing state facilities shall meet the minimum performance standards listed below.

916.4.1 General Service Fluorescent Lamps and Incandescent Lamps: Each of the following general service fluorescent lamps and incandescent reflector lamps installed shall meet or exceed the following lamp efficacy and CRI standards:

Standards for Fluorescent Lamps

Lamp Type	Nominal Lamp Wattage	Minimum CRI	Minimum Avg Lamp Efficacy (LPW)
4-ft medium bi-pin	>35W	69	75.0
	<35W	60	75.0
2-ft U-shaped	>35W	69	68.0
	<35W	60	64.0
8-foot slimline	>65W	69	80.0
	<65W	60	80.0
8-ft high output	>100W	69	80.0
	<100W	60	80.0

Standards for Incandescent Reflector Lamps

Nominal Lamp Wattage	Minimum Average Lamp Efficacy (LPW)
40-50	10.5
51-66	11.0
67-85	12.5
86-115	14.0
116-155	14.5
156-205	15.0

916.5 Energy Efficient Electric Motors:

916.5.1 Except for definite purpose motors and special purpose motors, each electric motor installed (alone or as a component of another piece of equipment) after October 1,1997, or in the case of an electric motor that requires listing or certification by a nationally recognized safety testing laboratory, after October 1,1999, shall have a nominal full load efficiency not less than the following:

Nominal Full-Load Efficiency

	Open Motors			Closed Motors		
# Poles =	6	4	2	6	4	2
Motor (horsepower)						
1	80.0	82.5	....	80.0	82.5	75.5
1.5	84.0	84.0	82.5	85.5	84.0	82.5
2	85.5	84.0	84.0	86.5	84.0	84.0
3	86.5	86.5	84.0	87.5	87.5	85.5
5	87.5	87.5	85.5	87.5	87.5	87.5
7.5	88.5	88.5	87.5	89.5	89.5	88.5
10	90.2	89.5	88.5	89.5	89.5	89.5
15	90.2	91.0	89.5	90.2	91.0	90.2
20	91.0	91.0	90.2	90.2	91.0	90.2
25	91.7	91.7	91.0	91.7	92.4	91.0
30	92.4	92.4	91.0	91.7	92.4	91.0
40	93.0	93.0	91.7	93.0	93.0	91.7
50	93.0	93.0	92.4	93.0	93.0	92.4
60	93.6	93.6	93.0	93.6	93.6	93.0
75	93.6	94.1	93.0	93.6	94.1	93.0
100	94.1	94.1	93.0	94.1	94.5	93.6
125	94.1	94.5	93.6	94.1	94.5	94.5
150	94.5	95.0	93.6	95.0	95.0	94.5
200	94.5	95.0	94.5	95.0	95.0	95.0

916.5.2 When products which meet the minimum efficiency standards are available from two or more manufacturers before the dates indicated, the specifications shall require that the product provided meet the efficiency standards shown above.

916.6 Lightning Protection Systems

The A/E shall evaluate the building to determine if a lightning protection system is required. Lightning protection systems shall be provided on structures with risk factor of 4 or greater as determined by NFPA 780.

916.7 Exterior Lighting Systems

Agencies are reminded of the requirements of Chapter 4, Section 4.34 of the Agency Procurement and Surplus Property Manual concerning the procurement of shielded Exterior Lighting.
A/E's are reminded of the requirements of Chapter 4, Section 4.34 of the Agency Procurement and Surplus Property Manual concerning the use of shielded fixtures when designing Exterior Lighting.

APSPM Chapter 4, Section 4.34 is quoted as follows for your information:

"4.34 **Procurement of Outdoor Light Fixtures:** All state agencies and institutions shall procure only shielded outdoor light fixtures, unless exempted in writing by DGS/DPS. A shielded outdoor light fixture is an outdoor light fixture that is (i) fully shielded so that no light rays are emitted by the installed fixture above the horizontal plane or (ii) constructed so that no more than two (2) percent of the total luminaire lumens in zone of ninety to 180 degrees vertical angles is permitted, if the related output of the luminaire is greater than 3200 (§ 2.2-1111.B.3 *Code of Virginia*). Measurement details for shielded outdoor light fixtures may be found in Illuminating Engineering Society of North America Guide LM-64-01, *Photometric Measurements of Parking Areas* (Newly Revised) which is available for order at www.IESNA.org under the "Publications" tab.

If an agency/institution has a bona fide reason for not complying with this section, the agency/institution may submit a request for waiver from this requirement to DGS/DPS on a "Procurement Exemption Request" form, which can be found in Annex 13-D of this manual. Bona fide reasons for not complying include operational, temporary, safety or specific aesthetic need is indicated or that such fixtures are not cost effective over the life cycle of the fixtures."

916.8 Bus Duct Installations

Include the following paragraph in specifications for bus ducts:

"The bus duct shall not be energized until the A/E has received and reviewed a letter from the Contractor and a Commonwealth of Virginia Licensed Professional Engineer provided by the Contractor, certifying that the installation was inspected and it was determined that the entire bus duct system has been properly installed in accordance with the bid documents, including approved shop drawings and/or manufacturer's instructions for this project."

The certification of this work shall include the torqued pressure used to tighten bolts at all spliced joints in the bus duct system.

916.9 Power Surge and Lightning/Grounding and Protection /Grounding of Energy Monitoring Control Systems (EMCS)

All EMCS equipment must be grounded to a true earth ground to protect it from the effects of lightning and electrical noise. The building ground should be checked at the building's power distribution panel

for a good earth ground termination. If the equipment in the building is connected to a ground with higher resistance than that of the EMCS/BAS equipment, transients may be suppressed through the EMCS/BAS instead of the normal path resulting in possible damage to the EMCS/BAS equipment (a properly grounded EMCS/BAS may still be damaged by a poor building ground system). Do not rely on bolted structural steel to provide earth ground. Structural steel sweats and corrodes which causes higher resistance. Also corroded or galvanized pipe and small-gauge wire can cause the same problem. Cold water piping is a substandard earth ground.

Lightning arresters must be used at each point where a bus cable enters or exits a building. (Cable running between buildings should be protected at both ends.) The arrester should be a permanent, non-interrupting, non-faulting device with a fast (5 NANO-second range) response time for turn-off and turn on. Each arrester must be grounded directly to a ground rod. MOVs (metal oxide varisters) should be used as indicated by the EMCS manufacturer to further reduce the effects of lightning and electrical noise.

External electrical power surge and noise filtering devices should be used on all power feeds to the EMCS. Telephone lines connected directly to a EMCS panel (Internal Modem) should be protected by a power surge and noise filtering device.

916.10 Class 2 and Class 3 Electrical Cables

All cables including but not necessarily limited to data, voice, alarm, and security system cables and wires, installed in State-owned facilities shall be self-supported with an approved hanger device when cables or wires are not installed in an electrical raceway. Cables shall be supported at no greater than twelve foot intervals and securely fastened to the building structure. Installation to be in accordance with NEC 725.

916.11 Telecommunications Cabling Standards

916.11.1 The Council on Information Management has adopted Standards for Telecommunications Cabling which shall be used when preparing designs related to telecommunications wiring for state owned buildings.

916.11.2 The following standards of the Electronic Industries Association, Engineering Department, 2001 Pennsylvania Avenue NW, Washington, DC 20006 are referenced in the Telecommunications Cabling Standard:

ANSI/EIA/TIA-568-A. Commercial Building Telecommunications Cabling Standard

ANSI/EIA/TIA-569. Commercial Building Telecommunications Pathways and Spaces

ANSI/EIA/TIA-570. Residential and Light Commercial Telecommunications Cabling Standard

ANSI/EIA/TIA-606. Administration Standard for the Telecommunications Infrastructure for Commercial Buildings

ANSI/EIA/TIA-607. Commercial Building Grounding and Bonding Requirements for Telecommunications

916.12 Aluminum Conductors

916.12.1 Aluminum conductors smaller than No. 4 shall not be used on state electrical work.

917.0 AGENCY STANDARDS

917.1 Agency Design Standards: A/E shall obtain from the agency with which it has a contract for services the Design Criteria and Standards which the Agency has for its site or campus. Such Criteria and Standards shall not conflict with nor supersede the standards stated in this Manual unless approved in writing by the Director of the Division of Engineering and Buildings.

917.2 Agency Construction Standards: A/E shall obtain from the agency with which it has a contract for services the Construction Criteria and Standards which the Agency has for its site or campus. Such Criteria and Standards shall be used by the A/E to prepare the Special Conditions to be included in the Contract Documents.

918.0 RESERVED

919.0 RESERVED

920.0 RESERVED

921.0 FIRE ALARM SYSTEMS – Supplemental Requirements

921.1 General: The information contained within this Section is intended to supplement the requirements of CPSM Section 721 Fire Alarm Systems. The Schematic Design and Preliminary Design Submission requirements contained within this section are required for all Capital Projects to be reviewed by BCOM and are recommended to be preformed by the respective Agencies for Projects with "Delegated Authority".

921.2 Schematic - Basis of Design Narrative: Provide a general description of the Fire Alarm Systems proposed for this project. Show and identify the proposed rooms/spaces to contain the major Fire Alarm System Control and Trouble Signaling Panels.

921.3 Preliminary - Basis of Design Narrative: Provide a description of the Fire Alarm Systems proposed for this project.

921.3.2 Preliminary Drawings: The drawings shall contain the following information"

1. Show the locations of and identify the proposed Fire Alarm System alarm-initiating and notification appliances.
2. Show the locations of and identify the proposed Fire Alarm control and trouble signaling equipment.
3. Show the locations of and identify all Existing Alarm System alarm-initiating and notification appliances.
4. Show the locations of and identify all Existing Fire Alarm control and trouble signaling equipment.

921.3.3 Preliminary Specifications: Provide preliminary outline Specifications to reflect the Systems that are defined on the Preliminary Drawings to be utilized for this project.

921.4 Additional Work to Attain Compliance: Additional work required by the Regional Office of the State Fire Marshal to attain compliance of the Fire Alarm Systems is considered a "Design Error and/or Omission". Compliant with CPSM Section 308.0 Design Errors and/or Omissions and A/E Liability Insurance, the Engineer of Record is responsible for all resulting costs.

922.0 FIRE SUPPRESSION SYSTEMS (SPRINKLERS) – Supplemental Requirements

922.1 General: The information contained within this Section is intended to supplement the requirements of CPSM Section 722 FIRE SUPPRESSION SYSTEMS (SPRINKLERS). The Schematic Design and Preliminary Design Submission requirements contained within this section are required for all Capital Projects reviewed by BCOM and are recommended to be preformed by the respective Agencies for Projects with "Delegated Authority".

922.2 Schematic - Basis of Design Narrative: The narrative shall provide the following information:

1. Provide a general description of the Fire Sprinkler Systems proposed for this project.

2. Provide an indication of the Water Supply to the proposed building and an indication if a Fire Pump is required. (Calculations to support this position are desirable but are not required.)

922.2.2 Schematic Drawings: The drawings shall provide the following information:
Show and identify the proposed spaces/rooms pertaining to the major Fire Sprinkler Components such as the location or room in which the Fire Pump, Fire Pump Controller, System Alarm Valves are to housed.

922.3 Preliminary - Basis of Design Narrative: Provide a description of the Fire Sprinkler Systems proposed for this project.

922.3.2 Preliminary Drawings: The drawings shall provide the following information:

1. Identify the Occupancy Hazard Classification and show the location of sprinklers for the most hydraulically demanding zone(s) within the building for each Fire Sprinkler System. The locations of Sprinklers are to be based on the VUSBC, NFPA 13 and the User's Programmatic Requirements.
2. Show the location of Fire Department Valves and Risers within the building. Indicate that the Fire Department Valves are attached to either a Standpipe Riser, Combined Standpipe and Sprinkler Riser, or Wet Pipe Sprinkler System Risers. The locations of Fire Department Valves are to be based on the VUSBC, NFPA 13, NFPA 14 and the User's Programmatic Requirements.
3. Show proposed sprinkler piping and standpipe layout including the main sprinkler lines and layout of branch lines for the most hydraulically demanding zone(s) within the building for each System. Indicate the size of all pipes that are shown.
4. Provide a table summarizing the characteristics of each of the Sprinkler Systems to be provided. Define the type of Sprinkler System(s), Areas of Coverage, Hazard, Minimum rate of water coverage (Density) per Area, Water required for each Area of Coverage, Hose Stream Allowances for each area, Total Water Requirements for each area of coverage, Hydraulically Calculated Pressure requirements at a common reference point at design flow for each area of coverage, and Water Supply (Flow & Pressure) available at the common reference point.
5. Provide a small scale drawing showing locations of water hydrants, test and flow hydrants (for waterflow tests), and routing of underground pipe. Indicate the Waterflow Test results, the date and time taken and who conducted the test. Indicate the Water Supply (Flow & Pressure) at a reference point common with the Sprinkler /Standpipe System Design.
6. Show and identify Existing Sprinkler Systems and Standpipe Systems.

922.3.3 Preliminary Specifications: The specifications are to contain the following information:

1. Provide preliminary outline Specifications that reflect the Systems that are to be utilized for this project.
2. Define the Acceptance Testing Requirements for this project.

922.3.4 Hydraulic Calculations: Provide Preliminary Hydraulic Calculations for the most hydraulically demanding zone for each of the Fire Sprinkler Systems compliant with NFPA 13.

922.4 Additional Work to Attain Compliance: Additional work required by the Regional Office of the State Fire Marshal to attain compliance of the Fire Suppression System(s) is considered a "Design Error and/or Omission". Compliant with CPSM Section 308.0 Design Errors and/or Omissions and A/E Liability Insurance, the Engineer of Record is responsible for all resulting costs.

923.0 FIRE SUPPRESSION SYSTEMS (CLEAN AGENT) – Supplemental Requirements

923.1 General

1. The information contained within this Section is intended to supplement the requirements of CPSM Section 723 FIRE SUPPRESSION SYSTEMS (ALTERNATE AGENT).
2 The Schematic Design and Preliminary Design Submission requirements contained within this section are required for all Capital Projects reviewed by BCOM and are recommended to be preformed by the respective Agencies for Projects with "Delegated Authority".

923.2 Schematic Phase

923.2.1 Basis of Design Narrative: The narrative shall provide the following information:

1. Provide a general description of the Fire Suppression Systems proposed for this project.
2. Indicate the NFPA Standard that is cited by the VUSBC which provides the minimum requirements for the design, installation, testing, inspection, approval, operation, and maintenance of the proposed Fire Suppression System.

923.2.2 Schematic Drawings: The drawings shall provide the following information:

1. Show and identify rooms/spaces that are to be protected by the proposed Fire Suppression System.
2. Identify the proposed locations, rooms, in which the major Fire Suppression System Components are proposed to be located.

923.3 Preliminary Design Phase

923.3.1 Basis of Design Narrative: Provide a description of the Fire Suppression System proposed for this project.

923.3.2 Preliminary Drawings: The drawings shall provide the following information:

1. Show and identify rooms/spaces to be protected by the Fire Suppression System.
2. Show the enclosure partitions of the protected area.
3. Identify the locations of the major Fire Suppression System Components.
4. Show the routing of the proposed Fire Suppression System lines between the stored agent and the protected spaces.
5. Provide a table that defines the type of Fire Suppression System(s), Areas of Coverage, Hazard of each protected space, Minimum required Concentration of Fire Suppression Agent, Volume of Agent required for each Area of Coverage.
6. Show and identify all Existing Fire Suppression Systems.

7. Provide a Fire Suppression System riser diagram that define the; fire suppression agent storage tanks, accessories, automatic detection system, alarm devices, manual means of releasing agent, controlled devices, etc…

923.3.3 Preliminary Specifications: The specifications shall contain the following information.

1. Provide preliminary outline Specifications to reflect the Systems that are to be utilized for this project.
2. Provide step-by-step description of the system sequence of operation for the alarm, notification, control and release of the Fire Suppression System.
3. Define the Acceptance Testing Requirements for this project.

923.3.4 System Calculations: Provide Preliminary Calculations that define the enclosure volume and quantity of agent required.

923.4 Additional Work to Attain Compliance: Additional work required by the Regional Office of the State Fire Marshal to attain compliance of the Fire Suppression System(s) is considered a "Design Error and/or Omission". Compliant with CPSM Section 308.0 Design Errors and/or Omissions and A/E Liability Insurance, the Engineer of Record is responsible for all resulting costs.

924.0 SPRAYED-ON FIREPROOFING DESIGN & SPECIFICATION -Supplemental Requirements

924.1 General

1. The information contained within this Section is intended to supplement the requirements of CPSM Section 724 SPRAYED-ON FIREPROOFING DESIGN & SPECIFICATION
2 The Schematic Design and Preliminary Design Submission requirements contained within this section are required for all Capital Projects reviewed by BCOM and are recommended to be preformed by the respective Agencies for Projects with "Delegated Authority".

924.2 Schematic Phase

924.2.1 Basis of Design Narrative: The narrative shall provide a general description of the locations, fire resistance ratings,

924.3 Preliminary Design Phase

924.3.1 Basis of Design Narrative: Provide a description of the application of Sprayed-on Fireproofing proposed for this project.

924.3.2 Preliminary Drawings: The drawings shall provide the following information:

1. Provide drawings that define the locations and extents of the application of Sprayed-on Fireproofing.

2. Define the proposed UL Design Assemblies specific to the respective locations and application of the Sprayed-on Fireproofing.

924.3.3 Preliminary Specifications: The specifications are to contain the following information:

1. Provide preliminary outline Specifications that reflect the Assemblies that are to be utilized for this project.
2. Define the Validation Tests Required for this project.

924.4 Additional Work to Attain Compliance: Additional work required by the Regional Office of the State Fire Marshal to attain compliance for the Fire Resistive Construction is considered a "Design Error and/or Omission". Compliant with CPSM Section 308.0 Design Errors and/or Omissions and A/E Liability Insurance, the Engineer of Record is responsible for all resulting costs.

925.0 RESERVED

926.0 RESERVED

927.0 FIRE PUMP(S) – Supplemental Submission Requirements

927.1 General

1. The information contained within this Section is intended to supplement the requirements of CPSM Section 727 FIRE PUMP(S).
2 The Schematic Design and Preliminary Design Submission requirements contained within this section are required for all Capital Projects reviewed by BCOM and are recommended to be preformed by the respective Agencies for Projects with "Delegated Authority".

927.2 Schematic Phase

927.2.1 Basis of Design Narrative: The narrative shall provide an indication of the Water Supply to the proposed building and an indication if a Fire Pump is required. (Calculations to support this position are desirable but are not required.)

927.2.2 Schematic Drawings: The drawings shall provide the following information:
Show and identify the proposed spaces/rooms pertaining to the major Fire Pump Components such as the location or room in which the Fire Pump and Fire Pump Controller are to be housed.

927.3 Preliminary Design Phase

927.3.1 Basis of Design Narrative: Provide a description of the Fire Pump Components and description of operation specific to this project.

927.3.2 Preliminary Drawings: The drawings shall provide the following information:

1. Show the location of the Fire Pump, Pressure Maintenance Pump and Pump Controllers.
2. Provide a small scale drawing showing locations of water hydrants, test and flow hydrants (for waterflow tests). Indicate the Waterflow Test results, the date and time taken and who conducted the test. Indicate the Water Supply (Flow & Pressure) at a reference point common with the Sprinkler /Standpipe System Design.
3. Show and identify all existing Sprinkler Systems and Standpipe Systems in the vicinity of the fire pump(s).
4. Show the approximate location of the Fire Department Connection(s) and piping back to the Fire Pump.
5. Show the approximate location of the Fire Pump Test Header and all interconnecting piping.
6. Show the location of the electrical components of the Fire Pump, Driver, and Fire Pump Controller.
7. Where multiple fire pumps or multiple sources of power are required, provide a diagram on the drawings that defines the applicable components and defines the sequence of operation.

927.3.3 Preliminary Specifications: The specifications are to contain the following information:

1. Provide preliminary outline Specifications that reflect the Systems that are to be utilized for this project.
2. Define the Acceptance Testing Requirements for this project.

927.3.4 Hydraulic Calculations: Provide Preliminary Hydraulic Calculations for the most hydraulically demanding zone for each of the Fire Sprinkler Systems compliant with NFPA 13.

1. Provide preliminary Hydraulic Calculations that indicate that the most hydraulically demanding Zone(s) of the Fire Sprinkler System(s) will be satisfied by the Automatic Water Supply (water supply plus fire pump) compliant with the requirements of NFPA 13, NFPA 14, and NFPA 20.
2. Where the height of the structure is beyond the capacity of the Fire Department Apparatus, provide hydraulic calculations that indicate that the performance of the Standpipe System(s) as connected to the Automatic Water Supply (water supply plus fire pump) will be compliant with the VUSBC, NFPA 13 & NFPA 14.

927.4 Additional Work to Attain Compliance: Additional work required by the Regional Office of the State Fire Marshal to attain compliance of the Fire Suppression System(s) is considered a "Design Error and/or Omission". Compliant with CPSM Section 308.0 Design Errors and/or Omissions and A/E Liability Insurance, the Engineer of Record is responsible for all resulting costs.